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SERIES A: AGRICULTURAL.

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ERRATA.

Page	4	line	34	for	" *perniciosus* "	read	" *filamentosus,* Ckll. (*perniciosus,* N. & W.)"
,,	6	,,	27	,,	" *Apechtis* "	,,	" *Apechthis* "
,,	9	,,	8	,,	" *beckii* "	,,	" *ulmi* "
,,	16	,,	46	,,	" *vulgivagellus* "	,,	" *vulvivagellus* "
,,	23	,,	38	,,	" *Cephalonomyia* "	,,	" *Cephalonomia* "
,,	31	,,	35	,,	" no. 4 "	,,	" no. 5 "
,,	39	,,	11	,,	" *cephalanti* "	,,	" *cephalanthi* "
,,	52	,,	24	,,	" *mauretanicus* "	,,	" *mauritanicus* "
,,	52	,,	41	,,	" *floridenis* "	,,	" *floridensis* "
,,	61	,,	23	,,	" *Peletieria* "	,,	" *Peleteria* "
,,	75	,,	36	,,	" *Spalgius* "	,,	" *Spalgis* "
,,	88	,,	25	,,	" *schupeli* "	,,	" *schüppeli* "
,,	88	,,	35	delete	" ; *Ceratitis capitata* (Mediterranean fruit-fly) "		
,,	92	,,	16	for	" *Phalangina* "	read	" *Phalangium* "
,,	92	,,	18	,,	" *Pholeus optioneides* "	,,	" *Pholcus opilionoides* "
,,	92	,,	19	,,	" *Micromata* "	,,	" *Micrommata* "
,,	92	,,	21	,,	" *Saltiscus sceniscus* "	,,	" *Salticus scenicus* "
,,	100	,,	39	,,	" *L. novimundi* "	,,	" *C. novimundi* "
,,	117	,,	20	,,	" *R.A.E.*, A, vii, 288 ; "	,,	" *R.A.E.*,A,vii,228 ; "
,,	119	,,	24	,,	" *lineola* "	,,	" *lineolata* "
,,	122	,,	38	,,	" *H. fornicatus* "	,,	" *X. fornicatus* "
,,	139	,,	13	,,	" *lactella* "	,,	" *lacteella* "
,,	145	,,	14	,,	" *Cocus* "	,,	" *Cocos* "
,,	148	,,	30	,,	" MERRIT HAWKES "	,,	" MERRITT HAWKES "
,,	152	,,	27	,,	" F."	,,	" Payk."
,,	153	,,	35	,,	" *stictictalis* "	,,	" *sticticalis* "
,,	161	,,	37	,,	" *Harmaloga* "	,,	" *Harmologa* "
,,	162	,,	48	,,	" *C.*"	,,	" *Coleophora* "
,,	168	,,	27	,,	" *Lygus* "	,,	" *Ligyrus* "
,,	172	,,	28	,,	" lxxvi "	,,	" lxxv "
,,	174	,,	39	,,	" *Propilea* "	,,	" *Propylaea* "
,,	176	,,	26	,,	" *Pycnoscelis* "	,,	" *Pycnoscelus* "
,,	183	,,	19	,,	" *Cercocephala* "	,,	" *Cerocephala* "
,,	190	lines	29 & 34	for	" *krauhniae* "	,,	" *kraunhiae* "
,,	193	line	40	for	" *micans* "	,,	" *micacea* "
,,	196	,,	4	,,	" *coeca* "	,,	" *caeca* "
,,	207	,,	15	,,	" *Lasiaptera* "	,,	" *Lasioptera* "
,,	210	,,	27	,,	" *P. corymbatus* "	,,	" *Pseudococcus corymbatus* "
,,	219	,,	15	,,	" ILLINGWORTH (F. J.)."	,,	"ILLINGWORTH(J.F.)."
,,	221	,,	18	,,	" *Tramia* "	,,	" *Trama* "
,,	222	,,	38	,,	" *opalesens* "	,,	" *opalescens* "
,,	223	,,	19	,,	" *Grapholita* "	,,	" *Grapholitha* "
,,	223	,,	29	,,	" *betalae* "	,,	" *betulae* "
,,	234	,,	5	,,	" *B.*"	,,	" *Bacillus* "
,,	235	,,	35	,,	" *Ipomaea* "	,,	" *Ipomoea* "

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ERRATA—*cont.*

Page 236 line 13 for " *Anthomus* " read " *Anthonomus* "
,, 236 ,, 17 ,, " *sclebrosus* " ,, " *salebrosus* "
,, 254 lines 9 & 11 for " *Hylesinus* " ,, " *Hylastes* "
,, 267 line 24 for " *Adomonita* " ,, " *Admontia* "
,, 283 ,, 48 ,, " *Hyalopteris* " ,, " *Hyalopterus* "
,, 304 ,, 16 ,, " *Philaphedra* " ,, " *Philephedra* "
,, 310 ,, 17 ,, " *schenchi* " ,, " *schencki* "
,, 312 lines 4 & 16 for " *velutina* " ,, " *velutinana* "
,, 335 line 15 for " *Ericoccus* " ,, " *Eriococcus* "
,, 335 ,, 37 ,, " *sanguineolenta* " ,, " *sanguinolenta* "
,, 336 ,, 49 ,, " *Eurotoma* " ,, " *Eurytoma* "
,, 342 ,, 23 ,, " *Droyopeia* " ,, " *Dryopeia* "
,, 375 ,, 45 ,, " *machoeralis* " ,, " *machaeralis* "
,, 382 ,, 11 ,, " *Euttetix* " ,, " *Eutettix* "
,, 389 ,, 7 ,, " *R.A.E.*, A, viii, 74 " ,, " *R.A.E.*, A, vii, 74 "
,, 390 ,, 5 ,, " *Aphis* " ,, " *Chromaphis* "
,, 405 ,, 54 ,, " *morilli* " ,, " *morrilli* "
,, 406 ,, 39 ,, " *cevaliae* " ,, " *cevalliae* "
,, 413 ,, 33 ,, " *argilacea* " ,, " *argillacea* "
,, 417 ,, 17 ,, " *Chaetopsila* " ,, " *Chaetospila* "
,, 419 lines 27, 32 & 38 for " *rubecola* " ,, " *rubecula* "
,, 419 line 40 for " STACHELIN (M.)." ,, " STAEHELIN (M.)."
,, 431 ,, 26 ,, " *Pineas* [? *Pissodes*] *pini* " ,, " *Chermes* (*Pineus*) *pini* "
,, 436 ,, 45 ,, " *Symphiocarpus* " ,, " *Symphoricarpus* "
,, 448 lines 15 & 16 should read " *Phytodecta fornicata*, Brügg. (*Gonioctena sexpunctata*, Panz.) and *Subcoccinella vigintiquatuorpunctata*, L. (*Epilachna globosa*, Schneid.)."
,, 450 ,, 19, 35 & 42 for " *albiditarsus* " read " *albiditarsis* "
,, 460 ,, 22 ,, " EYRE (J. R.)." ,, " EYER (J. R.)."
,, 470 ,, 26 ,, " *ormeroides* " ,, " *ormerodis* "
,, 496 ,, 36 ,, " *Thaumatopoea* " ,, " *Thaumetopoea* "
,, 510 ,, 14 ,, " *Pristoloryctes* " ,, " *Pristodoryctes* "
,, 514 ,, 34 ,, " *Hyposcoma* " ,, " *Hyposmocoma* "
,, 559 ,, 3 ,, " *jaman* " ,, " *jambolana* "
,, 571 ,, 22 ,, " *stegmatus* " ,, " *stigmatus* "
,, 592 ,, 50 ,, " *Tenebrioides* " ,, " *Tenebroides* "
,, 595 ,, 49 ,, " *arguala* " ,, " *argaula* "
,, 597 ,, 22 ,, " Swaine " ,, " Swain "

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REVIEW
OF
APPLIED ENTOMOLOGY.

SERIES A.

VOL. IX.] [1921.

MOLZ (E.). **Weitere Beiträge zur Kenntnis der Gartenhaarmücke (*Bibio hortulanus*, L.).** [Further Contributions to the Knowledge of *B. hortulanus*.]—*Zeitschr. angew. Entom., Berlin*, vii, no. 1, September 1920, pp. 92–96, 3 figs.

It is only of recent years that the economic importance of *Bibio hortulanus*, L., has been recognised. An attempt is here made to complete to some extent the observations previously made by the present author and Pietsch when sugar-beet, barley and oats were recorded as attacked [*R.A.E.*, A, ii, 377].

In September 1918 potatoes in a field near Halle were found damaged beneath their skins, and the larvae of *B. hortulanus* were found to be the cause. In uprooted potatoes only a few larvae were found and then only in concealed portions, thus confirming the view that dry conditions are unfavourable to them [*loc. cit.*]. Most of the larvae had apparently left the uprooted potatoes and gone underground. They were seen in numbers on roots when the latter were being dug. Only those parts of the field that had received stable manure were infested. In November the field was ploughed up, manured, and sown with winter wheat. Soon afterwards the presence of the larvae was noticed along the drills, and it was found that they were feeding on the seed. Laboratory experiments showed that when the seeds begin to swell they are attacked at the point of germination. Potatoes are preferred to the wheat grains, but experiment showed that infestation occurs only in potatoes that have suffered some previous injury.

Potato-skins steeped in a 1 per cent. solution of arsenious acid are an attractive and effective poison-bait.

NAGEL (W.). **Beitrag zur Biologie der Kleidermotte** (*Tineola biselliella*) **und ihrer Bekämpfung mittels Cyanwasserstoffs.** [A Contribution to the Biology of *Tineola biselliella* and its Control by Means of Hydrocyanic Acid Gas.]—*Zeitschr. angew. Entom., Berlin*, vii, no. 1, September 1920, pp. 164–171.

The eggs of *Tineola biselliella*, Humm., are laid in sheltered situations, preferably near food, without being attached to their support. One female lays from 50 to 90 eggs. Oviposition begins a day after mating

and lasts for over 2 weeks. The maximum deposition occurs between the 7th and 11th days. Both in August and in January (at room temperature) incubation lasts 8–10 days. Parthenogenetic reproduction does not take place. The young larvae at once begin feeding and prepare tube-like webs from the fibres or hairs of the material at their disposal. When the larvae moult they construct oval-shaped cocoons, somewhat pointed towards the ends. The larvae are not confined to their food-substances for the material for their cocoons; paper, glass-wool, their own excreta, etc., may be used. The number of moults varies, with an observed maximum of 11. On an average the first moult occurs 9–10 days after hatching, the second after an interval of 12–13 days, the third after an interval of 15–20 days. An average interval of 25 days separates the further moults. The larval stage varies in duration according to the number of moults. Feeding tests confirm Frickhinger's observations that cotton, linen and silk are either rejected or unwillingly accepted, and the resultant moths were only half the size of those from larvae fed on wool. Larvae that are kept from feeding withdraw into their cocoons, pass through a resting stage, pupate and yield adults able to deposit fertile eggs. Food was withheld from 3-week-old larvae for 8½ months; some died, but the others, on being fed, developed in a normal manner.

Pupation takes place in the above-mentioned cocoons, this stage usually lasting 18 or 19 days.

The adults mate on emerging, and have an average life of 30 days. There are two chief flight periods, in spring and in autumn, but they are not sharply differentiated owing to the prolonged larval stage. In general it may be said that the period from egg to egg extends from 5½ to 8½ months. For this reason all stages are present throughout the year.

Most preparations used against this moth hitherto have been repellents such as camphor, naphthaline, etc., designed for impregnating the various cloths, but as they cannot entirely prevent oviposition and do not kill the larvae already present, they are useless to check the pest. Neither repellents nor substances effective against only one of the stages are satisfactory. Fumigation with hydrocyanic acid gas solves the problem. A number of experiments were made to ascertain the requisite strengths, and the results are given in tabular form. As Andres had previously observed, the larvae are the most resistant, but they succumb in 2 hours to 1 volume of gas per cent., in 4 hours to 0·5 volume per cent., or in 16 hours to 0·2 volume per cent. These figures also apply to the pupae. The eggs are destroyed by an exposure of 1 hour to 0·25 volume per cent., and the same lack of resistance is shown by the adults, the figures representing actual and not calculated strengths. In practice either the strength or the time must be doubled, as it will not be possible to maintain unimpaired a strength of 1 per cent. during a period of 2 hours.

Stellwaag (F.). **Arsenmittel gegen Wein—und Obstbauschädlinge.** [Arsenic Preparations against Pests of Vines and Fruit Trees.]—*Zeitschr. angew. Entom., Berlin,* vii, no. 1, September 1920, pp. 172–180.

Paris green and Urania green are the two best-known arsenical insecticides. Though manufactured in Germany, it is only of quite recent years that their use has been permitted there. In 1917 the

supplies of nicotine were just sufficient to spray against the first generation of the vine moths [*Clysia ambiguella* and *Polychrosis botrana*]; and vine-growers resorted to arsenicals against the second generation with great success and without untoward consequences. This last point is emphasised, attention being drawn to the enormous quantities used throughout the world, to the arsenic content of various food-stuffs and of the water of various medicinal springs. In the instructions for spraying the second generation of vine moths it was laid down that spraying should not be carried out less than 5 weeks before the vintage, thus precluding any possible danger. Since 1917, arsenicals have proved invaluable both to vine-growers and orchardists, and it is very necessary that stringent legislation should not deprive them of their crops.

In a supplementary note Dr. Escherich sharply criticises a circular issued by the Imperial Biological Institute in conjunction with the Imperial Health Ministry in which the use of arsenicals against the second generation of vine moths is deprecated as dangerous.

Zacher (F.). **Neue und wenig bekannte Spinnmilben.** [New and little-known Spinning Mites.]—*Zeitschr. angew. Entom., Berlin,* vii, no. 1, September 1920, pp. 181–187, 16 figs.

A few preliminary descriptive notes are given on a number of spinning mites, some being new species, including *Paratetranychus gossypii*, sp. n., from cotton leaves in Togo, this being the first definite record of a spinning mite on cotton in Africa; *Paratetranychus* sp., from leaves of *Terminalia catappa* in East Africa; *P. pilosus*, C. & F., the food-plants of which in Germany include grape-vine, *Ribes sanguineum*, pears, apples, *Rosa* sp., plums and other species of *Prunus*; *Paratetranychus ununguis*, Jac., on young oaks forming an undergrowth in a pine forest near Berlin, and probably an accidental infestation, the oak spinning-mite being *Tetranychus carpini*, Oud.; *Schizotetranychus schizopus*, Zacher, from various willows (*Salix* spp.) in Germany; *Tetranychus carpini*, Oud., from oak and hazel (*Corylus avellana* and *C. maxima*) in Germany; *Tetranychus telarius*, L., on lime, maple and horse-chestnut in Germany; *T. salicicola*, sp. n., from *Salix daphnoides*, *S. viminalis*, *S. alba*, and *Populus candicans* in Germany; *T.* (*Epitetranychus*) *viennensis*, sp. n., from pear, *Prunus acida*, and *P. avium* var. *juliana*, in Austria and Germany; *T.* (*E.*) *ludeni*, Zacher, on *Hibiscus rosa-sinensis*, *Abutilon* spp., *Acalypha* spp., *Solanum melongena*, *Physalis peruviana*, *Salvia splendens*, *Dolichos lablab* and other plants in France and Germany, into which latter country it must have been introduced, as it does not occur on native wild plants.

Ein deutscher Reichskommissar für Schädlingsbekämpfung. [A German Imperial Commissioner for Pest Control.]—*Zeitschr. angew. Entom., Berlin,* vii, no. 1, September 1920, pp. 188–189.

Commenting on the recent appointment of a German Imperial Commissioner for Pest Control who will deal with all injurious insects, a viticultural journal points out that viticulture will greatly benefit, but only if this official is provided with all needful resources and is not subject to hindrance by other departments.

STELLWAAG (F.). **Bericht über das Auftreten und die Bekämpfung tierischer Weinbergsschädlinge für die Jahre 1918 und 1919.** [Reports on the Occurrence and Control of Insect Pests of Vineyards in 1918 and 1919.]—*Zeitscher. angew. Entom., Berlin,* vii, no. 1, September 1920, pp. 192–196.

In 1918 the chief pests in the Rhine Palatinate were the vine-moths [*Clysia ambiguella* and *Polychrosis botrana*], in the second generation of which there was, however, a great decrease in numbers owing to the previous dry weather. This generation was combated with arsenicals, nicotine having been used against the first generation. Other pests were the mites, *Phyllocoptes* and *Epitrimerus vitis,* Nal., the area of distribution of which was larger than in the preceding year. Owing to prevailing circumstances, preventive treatment was impossible, except that a few growers used nicotine-soap in the spring with satisfactory results. *Byctiscus betulae* again appeared in considerable abundance, and *Sparganothis* (*Tortrix*) *pilleriana* seemed to be increasing.

In 1919 vine-moth injury was more considerable. Arsenicals were used against these pests and saved from two-thirds to four-fifths of the vintage. Mites seemed to have increased, *Eriophyes* (*Phytoptus*) *vitis* being noticed in many localities.

Zur Verwendung von Arsenmitteln im Weinbau. [The Use of Arsenic Preparations in Viticulture.]—*Zeitschr. angew. Entom., Berlin,* vii, no. 1, September 1920, pp. 197–198.

The German Viticultural Association asks that the use of arsenicals be freely permitted instead of hindered by such recommendations as that issued by the Imperial Biological Institute for Agriculture and Forestry.

MORSTATT (H.). **Weitere Beobachtungen über das Auftreten der Wollaus in Aegypten.** [Further Observations on the Occurrence of *Pseudococcus perniciosus* in Egypt.]—*Zeitschr. angew. Entom., Berlin,* vii, no. 1, September 1920, pp. 197–198.

This is a record of the author's observations on *Pseudococcus* (*Dactylopius*) *perniciosus,* Newst. & Willcocks, on *Albizzia* [*lebbek*] in Cairo [*R.A.E.*, A, i, 121 ; ii, 146]. Where the trees are near water, there is every reason for expecting success from measures consisting in lopping off infested branches, cutting back the trees, and washing them once a week with a fire hose until the winter. The authorities are, however, gradually replacing the trees with immune species.

LINDINGER (L.). **Die Belästigung der Obsteinfuhr durch die San-José-Schildlaus-Gesetzgebung vom wissenschaftlichen Standpunkt aus.** [A Scientific View of the Hindrance to Fruit Importation by the San José Scale Legislation.]—*Zeitschr. angew. Entom., Berlin,* vii, no. 1, September 1920, pp. 205–207.

The author, who is chief of the Zoological Division for Plant Protection in Hamburg, criticises the San José Scale Law. Its operation will not prevent the importation of fruit infested with *Aspidiotus perniciosus* into Germany, the introduction of which by means of fruit

has never led to an infestation of fruit or other trees. The entire procedure is useless, illogical and a hindrance to trade. Those whose interests are affected by the Law should have it repealed.

MECKBACH (E.). **Zur Bekämpfung der Kleidermotte.** [Measures against the Clothes Moth.]—*Zeitschr. angew. Entom., Berlin,* vii, no. 1, September 1920, pp. 207–208.

The author, who is on the staff of the Bayer Dye Works, states that after several years' work a substance has been discovered that can be used for impregnating white or coloured woollen clothes and confers a lasting protection against the clothes moth [*Tineola biselliella*].

QUAINTANCE (A. L.) & BAKER (A. C.). **Control of Aphids injurious to Orchard Fruits, Currant, Gooseberry and Grape.**—*U.S. Dept. Agric., Washington, D.C.,* Farmers' Bull. 1128, June 1920, 48 pp., 4 plates, 34 figs. [Received 28th October 1920.]

This bulletin deals with 41 species of Aphids injurious to the foliage and fruit of apple, quince, pear, plum, cherry, peach, currant, gooseberry and grape. Much of the information given has been noticed elsewhere [*R.A.E.*, A, vi, 212]. The rosy aphis then recorded as *Aphis malifoliae,* Fitch, is now called *Anuraphis roseus,* Baker.

RAND (F. V.) & ENLOWS (E. M. A.). **Bacterial Wilt of Cucurbits.**—*U.S. Dept. Agric., Washington, D.C.,* Bull. 828, 10th May 1920, 43 pp., 10 figs., 4 plates. [Received 28th October 1920.]

Further experiments on the transmission of bacterial wilt of cucurbits confirm the results noticed in previous papers [*R.A.E.*, A, iv, 38, 385]. Spraying with Bordeaux mixture 4–5–50 with 2 lb. of lead arsenate paste as soon as the first leaves develop is advocated for the treatment of this disease. Other remedial measures include the control of the beetles concerned, viz., *Diabrotica vittata,* F., and *D. duodecimpunctata,* Ol. [*loc. cit.* vii, 521.]

SILVESTRI (F.). **A new Termite from Mesopotamia.**—*Ann. Mag. Nat. Hist., London,* vi, no. 35, November 1920, pp. 477–479, 1 plate.

Microcerotermes diversus, sp. n., here described, makes colonies under the bark of dead trees, especially apricot trees. It is very common at Amara in lower Mesopotamia.

COBB (N. A.). **A New Nema,** *Tylenchus musicola,* **n. sp., said to cause a serious Affection of the Bluggoe Banana in Grenada, British West Indies.**—*West Indian Bull., Barbados,* xvii, no. 4, 1919, pp. 179–182, 2 figs.

A description is given of the Nematode, *Tylenchus musicola,* sp. n., which is said to cause a serious disease of bananas in Grenada. A comparison is drawn between it and the closely related species *T. similis, T. penetrans* and *T. pratensis.*

TRÄGÅRDH (I.). **Undersökningar över Nunnans Uppträdande i Gualöv 1915-1917.** [Investigations on the Occurrence of the Nun Moth near Gualöv in 1915–1917.]—*Medd. Statens Skogsförsöksanstalt, Stockholm,* Häft 17, no. 4, 1920, pp. 301–328, 6 figs. [With a Summary in German.]

In the last century there were periodical outbreaks of the nun moth, *Liparis monacha,* in Sweden near Gualöv. In the summer of 1915 isolated caterpillars appeared and in August the moths were on the wing in large numbers. During 1916 and 1917 a count of the eggs was taken with the result that the infestation was classed as slight. As the position of the eggs on the trunk is important in connection with banding, careful observations were made. It was found that on stems of $3\frac{1}{4}$ inches diameter a band at breast height would afford protection against 50 per cent. of the newly hatched caterpillars, but that on stems of $6\frac{1}{2}$ inches diameter the band must be 10 feet from the ground to have the same effect.

During the 1916 count careful note was taken of the dead eggs and empty shells of 1915. The figures obtained are not reliable as wind and weather must have carried away many eggs, and in proportion, more empty shells than dead eggs must have been lost. It is, however, interesting that a certain percentage of eggs remained undeveloped, In 1917, 36·3 per cent. of the eggs were dead; of these 21·8 were unfertilised and 14·5 contained dead larvae.

No egg-parasites were observed, but of other parasites Diptera predominated in the larvae and Hymenoptera in the pupae. The Hymenoptera included *Pimpla arctica,* Zett., *P. instigator,* F., *Theronia atalantae,* Poda, *Apechtis rufata,* Hgn., *A. dentata,* Thoms., and *Amblyteles quadripunctorius,* Müll. The last three have not been noticed before as nun moth parasites. The parasitic flies included *Sarcophaga* (*Agria*) *affinis,* Fall., a large Tachinid larva, and *Parasetigena segregata,* Rond., which last, though one of the most important parasites in Germany, has not been recorded hitherto in Sweden. In the autumn of 1916, *S. affinis* predominated; some authors think this species to be unimportant as they believe it to be saprophagous.

The egg-count in 1916 pointed to a reduction in infestation in the following years, and this proved to be the case. The observations in question confirm previous experience as to the great resistance of pines to nun moth attack.

OKUNI (T.). **Keshi no Gaichu Yoho.** [Insects injurious to the Poppy in Formosa; Preliminary Report.]—*Formosa Agric. Expt. Sta.,* Bull. 139, July 1920, pp. 1–30, 1 plate.

This report deals with the morphology and economic relations to the plants of the following pests of the poppy:—*Thrips* sp., which injures the stamens and pods; *Gryllotalpa africana,* Pall., attacking the roots; *Heliothis obsoleta,* F., injuring the young leaves and flower buds; *Agrotis ypsilon,* Rott., injuring the leaves; *Prodenia litura,* F., which attacks the stems and leaves; and *Phytometra ni,* Hb.

HARUKAWA (T.). **Nikwa-Meichu Shinsui Kujoho.** [A Method of Controlling the Two-brooded Paddy Borer (*Chilo simplex,* Butl.) by Submergence.]—*Nogaku Kwai Ho* [*Jl. Scientific Agric. Soc.*], *Tokyo,* no. 213, 5th May 1920, pp. 335–372.

Experiments as to whether the paddy borer may be controlled by submergence in water have been conducted by various Japanese

entomologists since 1895, and the results in the main show that this is not an effective measure. In 1912, however, the Prefectural Agricultural Experiment Station at Ehime reported that *Chilo simplex* may be entirely destroyed by immersing infested rice-stalks in water for a minimum of 28 hours.

In the course of laboratory experiments to determine this point the author first examined the question as to how long the borer can survive without air. For this purpose he placed the insects in the vapour of carbon bisulphide, assuming, as many authors have done, that this gas does no harm to the insects. Though there is some variation according to the stage of the insects and the temperature, after 24 hours in the gas 82 per cent. of the insects exposed were dead at ordinary temperatures.

In investigations as to the resistance of the borer to heat, no deaths occurred in any of the instars exposed to a temperature of 35·6° C. (96° F.) for 24 hours ; in the case of the second and third instars exposed to 41·8°—43·1° C. (108°—110° F.) for 6 hours, of the former 27·7 per cent. were dead, while of the latter none died ; in the fourth and fifth instars at 38°—41° C. (101°—106° F.) for 24 hours, only 4·4 per cent. were dead ; 45° C. (113° F.) killed all of the first instar larvae within an hour, of the second instar 74·7 per cent. and of the fourth and fifth 35·7 per cent. ; 45° C. (113° F.) killed all instars within 2 hours, as did 50° C. (122° F.) within 5 minutes.

In warm water death is caused by the combined effect of heat and suffocation. All of the first instar are killed in water at 45° C. (113° F.) after 5 hours ; of the second instar after 1 hour ; the third, fourth and fifth instars in water at 40° C. (104° F.) after 5 hours, and in water at 45° C. (113° F.) after 1 hour. In water at 50° C. (122° F.) all instars can be killed in 5 minutes. In this experiment the temperature of the water was constant. Warm water, the temperature of which gradually decreases, is not effective.

When rice-stalks infested with the borers were submerged, the great majority escaped, and 50 per cent. of the remainder were only killed in water at 23°—33° C. (73°—91° F.) after 24 hours' submergence. In field experiments the ratio of borers killed is still less.

As some entomologists are of opinion that petroleum might be effective for killing the escaping borers, tests of this were made, but it was not found effective at a strength that does not injure the rice-plant.

LAMBERT (F.) & PÉRONNE (P.). **Le Tché** (*Cudrania triloba*, **Hance**).—*Ann. d'Ecole Nat. Agric., Montpellier*, xvii, no. 2, July 1918–July 1919, pp. 86–104, 10 figs. [Received 2nd November 1920.]

In the course of this paper dealing with the cultivation and uses of *Cudrania triloba*, it is suggested that silkworms (*Bombyx mori*) fed on these leaves are less susceptible to disease. *B. pernyi* also thrives on them.

ZOATTI (—). **La Cocciniglia o Pidocchio del Fico.** [The Fig Scale, *Ceroplastes rusci*.]—*Riv. Agric., Parma*, xxvi, no. 44, 29th October 1920, p. 549.

The fig scale, *Ceroplastes rusci*, is common in Italy. From May to June, or even later, the female lays from 800 to 1,500 eggs. After an incubation period of 15 days the very mobile larvae spread over the plant and are carried by the wind to neighbouring ones. They attach

themselves to the upper surface of the leaves. Mating takes place in August or September. About the end of October the scales migrate to the branches, on which they remain until death follows oviposition in the following year.

The fig branches should be cleaned in winter, and sprays used of powerful insecticides, such as petroleum-soap emulsion, tar-oil, and calcium polysulphide, two applications being made not less than 15 days after the larvae appear.

FARRELL (J.). **Apple Culture in Victoria.**—*Jl. Dept. Agric. Victoria, Melbourne,* xvi, no. 11, November 1918, pp. 648–657; xvii, no. 1, January 1919, pp. 29–37; no. 3, March 1919, pp. 145–157; no. 5, May 1919, pp. 287–295 : 20 figs.

Among the insect pests here dealt with are :—*Cydia* (*Carpocapsa*) *pomonella* (codling moth); *Tortrix* (*Cacoecia*) *postvittana* (light-brown apple moth), which can be controlled by the same sprays as *C. pomonella; Teia anartoides* (painted apple moth), for which 1 lb. lead arsenate to 30 gals. water, applied when the caterpillars are young, is an effective remedy; *Pinara nana,* the larvae of which eat the leaves and buds at night and can be controlled by the sprays used for codling moth; and *Leptops hopei* (apple root borer).

The last-named weevil is indigenous to Australia, and is one of the most destructive pests of apples. Eggs are laid in the leaves in early spring, and the young larvae fall to the ground and find their way to the roots, into which they tunnel, causing the branches to die off. Lead arsenate sprays on the foliage have given good results, and great numbers of beetles have been caught by means of traps. An effective one consists of an inverted funnel of zinc fitting closely to the bark on the upper rim, with an aperture near the top, over which is a canister about 5 inches long and 1½ inch in diameter, made of perforated zinc with a light trap-door at the bottom. The beetles, impeded in their upward movement by the funnel, find the aperture and enter the trap. A simpler trap consists of a collar of zinc about 5 inches wide fitting closely to the bark, the beetles being unable to surmount the smooth surface, which, however, should be occasionally rubbed with fine emery paper or painted to maintain its smoothness. The beetles are collected by hand from below the traps and destroyed. Land that has been infested and cleared should be left for at least two years before re-planting, and it should be cropped in the meantime to ensure the eradication of the pest. Further studies should be made of the possibility of control by a parasite, *Perilitus leptopsi,* Vier.

Eriosoma lanigerum (woolly apple aphis) is one of the most widely spread apple pests, and one of the most difficult to deal with. The best sprays have proved to be tobacco wash (using 1 lb. old tobacco leaf or stems to 3 gals. of water, with soap at the rate of 1 lb. to 20 gals. of the solution) during the period of growth, and red oil emulsion during the dormant season. Red oil should not be used after the leaves appear. When the attack is confined to a few definite positions these parts may be painted with kerosene or eucalyptus oil, which are quicker in action and more deadly in effect. *Tetranychus telarius* (red spider) does much damage to apple trees if the leaves are not sprayed. The mite should be attacked in the egg-stage, and as this occurs during the dormant period, red oil emulsion may be used with success. Tobacco and soap solution also make an effective spray, which should be directed upwards, as the mites are generally most numerous under the leaves.

The importance of drastic measures against *Aspidiotus perniciosus* (San José scale) is emphasised. Oil emulsion (1 : 15) is a good spray to use when the leaves have fallen, with a second application later if necessary. Spraying should be begun in the autumn, when the scales are young. Crude petroleum emulsion is cheaper than red oil but is less effective. The method of fumigating trees with hydrocyanic acid gas is described. The same treatments may be used to control *Lepidosaphes beckii* (*Mytilaspis pomorum*) (apple-bark scale). The abundance of *Thrips tabaci* depends almost entirely on weather conditions. When it is present in great numbers, tobacco water, benzole emulsion, coal-tar water and other sprays have given good results on limited areas, but to cope satisfactorily with this pest on large areas is a difficult matter.

In discussing the fungous diseases of apple, some hints are given on combining insecticide and fungicide mixtures.

Illingworth (J. F.). **Cane Grub Investigation.**—*Queensland Agric. Jl., Brisbane,* xiv, nos. 3 & 4, September & October 1920, pp. 148–152 and 198–199.

Among the pests of sugar-cane dealt with is a Lygaeid, *Phaenacantha australica,* Kirk., which is commonly found on native grasses, and has lately turned its attention to sugar-cane. It only increases rapidly during the dry part of the year, and is consequently at its maximum during the cutting season, when the growth of the cane is not materially interfered with. When, however, the bugs are very numerous and suck the under-surfaces of the leaves, they must materially reduce the sugar content, and if at any time they should attack young cane, they will become a serious menace. The habits of this bug greatly resemble those of the chinch bug [*Blissus leucopterus*]. Hibernation occurs in bunches of grass and rubbish, and the newly hatched nymphs may be found there in April, but they soon climb into the cane leaves, where they are numerous from June to September. The punctured areas on the leaves become light coloured, then yellow, and finally brown, probably owing to the development of a fungus. When the spots are abundant the whole leaf dries up. In wet seasons the bugs are largely destroyed by a fungous disease. Egg-parasites have not as yet been studied, but several predaceous insects, chiefly Reduviids and the ant, *Pheidole megacephala,* feed upon the later stages.

As this pest breeds freely in grassy fields, clean cultivation is recommended, and the burning of rubbish should materially reduce its numbers, as in the case of the chinch bug.

Oil-Spraying Tests on Apple-Trees.—*New Zealand Jl. Agric., Wellington,* xxi, no. 2, 20th August 1920, p. 78.

Oil sprays may be safely used on apple trees in the dormant season. Even when used at a strength of 1–4 no damage was caused to the trees. In cases of growth being retarded owing to stronger sprays, the trees invariably made up the deficiency by the end of the season. Unsprayed trees were badly infested with San José scale [*Aspidiotus perniciosus*].

Stratford (G.). **Woolly Aphis Control Tests at Papanui.**—*New Zealand Jl. Agric., Wellington,* xxi, no. 2, 20th August 1920, pp. 85–86.

The results of these tests show that red oil used as a spray at a strength of 1–10 and heated to 120° F. is the most satisfactory insecticide for

the winter control of woolly aphis [*Eriosoma lanigerum*]. Black-leaf 40 is recommended for a summer spray, but it exercises only a temporary check. There is apparently no advantage in adding lime-sulphur to it.

HUTSON (J. C.). **The Paddy Swarming Caterpillar** (*Spodoptera mauritia*, **Boisd.**).—*Trop. Agric., Peradeniya*, lv, no. 3, September 1920, pp. 133–140, 1 plate.

An outbreak of *Spodoptera mauritia*, Boisd., occurred during November and December 1919 in some districts in Ceylon. The eggs of this moth hatch in from 7 to 10 days, and the caterpillars become full grown about a month after emergence. They then migrate to the edge of the fields and pupate in the soft earth, pupation lasting about two weeks and the total life-cycle from egg to the emergence of adults varying from 7 to 10 weeks according to climatic conditions, food-supply, etc.

Infestation may be prevented by early sowing, good cultivation, and collection of egg-masses. Remedial measures vary according to the particular local conditions, their essential aim being the destruction of the caterpillars and the prevention of their spread to neighbouring fields [*R.A.E.*, A, v, 500].

The natural enemies include parasitic Hymenoptera, fungous and bacterial diseases, predatory bugs and a beetle, *Cicindela sexpunctata*, F.

HUTSON (J. C.). **Crop Pests in Ceylon.**—*Trop. Agric., Peradeniya*, lv, no. 3, September 1920, p. 160.

The pests reported between 1st January and 30th June 1920 include the cockchafer grubs, *Lepidiota pinguis* and *Anomala superflua*, attacking roots of tea bushes; red slug, *Heterusia cingala*, on tea; *Spodoptera mauritia* (swarming caterpillar) and *Leptocorisa varicornis* (paddy bug) on rice; *Corcyra cephalonica* (rice moth) in stored rice and dried cacao beans; *Agrotis* spp. in vegetable gardens, against which collection of the cutworms and protection of young plants by means of tin circles or paper bands is apparently the best measure.

A consignment of Coccinellid beetles, *Novius cardinalis*, has been received from South Africa [*R.A.E.*, A, viii, 519].

NEWSTEAD (R.) & MORRIS (H. M.). **Bionomic, Morphological and Economic Report on the Acarids of Stored Grain and Flour: Part ii.**—*Repts. Grain Pests (War) Committee, Royal Society, London*, 1920, no. 8, pp. 1–15, 5 plates. [Received 4th November 1920.]

This report deals with the species of Acarids discovered in flour since the publication of the earlier results [*R.A.E.*, A, vii, 91], and records experimental work in connection with preventive and remedial measures against them.

Tyroglyphus longior, Gerv., which is a flour pest of primary importance, is so remarkably similar to *T. siro*, L., that its separation from that species is an extremely difficult matter. The chief points of contrast between the two are enumerated.

Histiogaster entomophagus, Lab., of which all stages except the hypopial nymph are described, lives in flour in much the same way as *T.* (*Aleurobius*) *farinae* [*loc. cit.*], and though multiplying less rapidly

than that species, it is capable of doing considerable damage and rendering flour unfit for use. It apparently occurs most commonly in flour that has been kept for some time. A sample of flour, said to have been packed in hermetically sealed tins and examined four years later, was found to be heavily infested by this mite. Excessive moisture seems to favour the propagation of *H. entomophagus*, and individuals in all stages of development were able to live for eight weeks floating on the surface of water, and for about two weeks when entirely submerged in it.

Glyciphagus fuscus, Oud., was found in only one sample of flour, and occurred very sparingly in association with *T. farinae*. Both male and female are described.

Experiments have been carried out with *T. farinae* only, as it is by far the most important species, and any treatment that would be effective against it would probably prove successful against the others. In previous experiments [*loc. cit.*] it was found that the minimum amount of moisture necessary to the existence of mites in flour was between 11·5 and 12·5 per cent. Further results were obtained by drying about 5 grams of flour in a steam oven for 24 hours. It was found that in flour with a moisture content of 13 per cent. the mites increased rapidly in numbers; with a moisture content of 12·4 per cent. the increase was relatively very slow; with 12·2 per cent. moisture they were gradually exterminated in two or three weeks. Below this moisture content the mites perished quickly. The minimum moisture content necessary for existence of the mites is therefore about 12·3 per cent., so that if 11 per cent. be taken as the maximum percentage of moisture permissible in stored flour there is a small margin of safety. The previous finding, namely, that a temperature of 120° F. for about 12 hours is the minimum temperature required for the destruction of all mites and eggs, was confirmed by further experiment. With regard to hermetical sealing, it was found that even after two months a few mites reappeared in jars so sealed, though care had been taken to avoid re-infestation.

A series of experiments was carried out to test the effect of passing infested flour through sieves of bolting-silk. Some eggs were able to pass through the finest silk used, which had 200 meshes per lineal inch, and this sieve was quite ineffectual in removing the faecal pellets which conduce to rapid decomposition of the flour, while much of the flour itself would not pass through such a sieve. In flour stored in an atmosphere of almost pure carbon dioxide for periods up to 50 hours the mites remained inert while the gas was present, but quickly became active again when the treatment was discontinued.

It is obvious that preventive measures are more desirable than remedies, owing to the production of large quantities of faecal matter, which it is impossible to eliminate from the flour. The most satisfactory method of preventing infestation is only to store flour the moisture content of which is below 11 per cent. in the temperate zone, and much lower in tropical countries. The usual amount of moisture present in commercial samples is between 12·5 per cent. and 14 per cent.; it would therefore be necessary to submit to a drying process any flour that it was intended to store for any length of time. Such a method as that of the Hess Drier and Cooler previously described [*loc. cit.*] has given success with wheat and should be more easily applied to flour; it has the additional advantage of preventing re-infestation, which very easily occurs in flour that has merely been heated in order to kill the mites.

Gough (G. C.). **Insect and Fungus Pests during the Winter: the Importance of Plant Hygiene.**—*Jl. Minist. Agric., London,* xxvii, no. 8, November 1920, pp. 772–775.

With few exceptions, such as the winter moth [*Cheimatobia brumata*], insect pests are in a dormant or semi-dormant condition during the winter, and many are to be found among the refuse of crops. Measures against them while in this condition are more economical in the end than any action that can be taken later.

Pests in the soil are most effectively controlled by working the land frequently so as to give birds every opportunity of discovering them. It has been noted that grease bands on trees on arable land have caught fewer moths than those on trees growing on grass. Ridging up land to allow access to frost has little effect on insect pests. Soil fumigants containing a basis of naphthaline are far from being generally successful, though they may enable a crop to become established and so to withstand injury.

Winter spraying is effective. A caustic soda spray will remove lichen, moss, etc., which shelter insect pests on the bark. Lime-sulphur is a cleansing agent as well as a fungicide and, unlike caustic soda, can be used every year if necessary without injuring the trees.

Spraying should be done after pruning, and it is best to wait till the buds have swollen, or even just commenced to open. Eggs are not nearly so vulnerable as the young larvae, which have usually hatched about February. Lime spraying done late not only cleans the trees, but when properly carried out, encases insect eggs and prevents hatching. Even when hatching takes place, the insects have difficulty in moving about in the particles of lime.

Munro (J. W.). *Cryphalus* (*Ernoporus*) *fagi*, **Nordm., in Surrey, etc.**—*Entom. Mthly. Mag., London,* Third Ser., no. 71, November 1920, p. 257.

Cryphalus fagi, Nordm., is recorded from the New Forest, and was also found on a dead branch of beech near Kew. The egg and larval tunnels were in the sapwood, the pupal chambers being cut deep in the sapwood and occasionally penetrating the pith.

Munro (J. W.). *Hylastes attenuatus*, **Er., in Britain.**—*Entom. Mthly. Mag., London,* Third Ser., no. 71, November 1920, p. 257.

Hylastes attenuatus, Er., is recorded as occurring in various localities in England on Scots pine and Corsican pine. In Central Europe it occurs indifferently on spruce and Scots pine.

Braid (K. W.). **Note on** *Typhlocyba douglasi*, **Edw.**—*Entom. Mthly. Mag., London,* Third Ser., no. 72, December 1920, p. 279.

It is now established that *Typhlocyba douglasi*, Edw., is one of the causes of the blotched appearance of the leaves of beech trees (*Fagus sylvatica*) in the south-east of England. Similar damage is caused by other Typhlocybids on elm, hornbeam, birch, ash and sycamore.

White (S. A.). **The Economic Value of our native Birds.**—*Science and Industry, Melbourne,* ii, no. 8, August 1920, pp. 494–500. [Received 4th November 1920.]

The food habits of native birds in Australia are of the greatest importance, owing to the steady increase of the worst insect pests of

agriculture ; and the great benefit that may be obtained by extending protection to them is here emphasised. Some of the most important birds economically are crows, particularly as enemies of the blow-fly, screech owls, plovers and quails, while almost all birds live on insect food during their nestling stages.

EVANS (H. H.). **Reports on Experiments for the Control of Green Aphis and Codling Moth.**—*14th Ann. Rept. Dept. Agric. 1919, Victoria, B.C.,* 1920, pp. Q 27–31.

In attempts to find an efficient and cheap spray for the green apple aphis [*Aphis pomi*], various combinations of insecticides were tested. Of these Blackleaf 40 (1 to 2,000) and slaked lime (2 lb. to 100 gals. water) is advocated as efficient and cheap.

Work in connection with codling moth [*Cydia pomonella*] was continued, and although an increased area has been brought under treatment, there is a decrease in the percentages of captures made.

LYNE (W. H.). **Report of Chief Inspector of Imported Fruit and Nursery Stock.**—*14th Ann. Rept. Dept. Agric. 1919, Victoria, B.C.,* 1920, pp. Q 45–49.

The pests intercepted include : *Aspidiotus perniciosus* (San José scale) ; *A. ostreaeformis* ; *Aulacaspis rosae* (rose scale) ; *Lepidosaphes ulmi* (oyster-shell scale) ; *Pulvinaria innumerabilis* ; *Icerya* sp. ; *Saissetia* (*Lecanium*) *hemisphaerica* ; *Coccus* (*L.*) *hesperidum* ; *Diaspis* sp. ; *Chionaspis* sp. ; *Aegeria* (*Sanninoidea*) *exitiosa* (peach root borer ; *Pennisetia* (*Bembecia*) *marginata* (blackberry crown borer) ; *Phylloxera* ; *Eriosoma lanigerum* ; *E. pyri* ; and the eggs of the gipsy moth [*Porthetria dispar*].

The recent occurrence of codling moth [*Cydia pomonella*] in Californian walnuts has necessitated extra precautionary measures against the entry of infested material. Considerable damage is caused to stored peanuts by *Plodia interpunctella.*

WHITEHOUSE (F. C.). **Entomological Report, 1919, of the Alberta Natural History Society.**—*Ann. Rept. Dept. Agric. Prov. Alberta, 1919, Edmonton,* 1920, pp. 127–129. [Received 5th November 1920.]

Weather conditions in Alberta during 1919 were very favourable to insect pests, and in consequence, the most serious losses occurred to crops that have been recorded for some years past. Cutworms, especially *Euxoa ochrogaster* (red-backed cutworm), were particularly troublesome in both fields and gardens ; it is suggested that in dry seasons favourable to their increase, sowing should be delayed in gardens until the ground has been treated with poison-bait. Other injurious cutworms were *Porosagrotis orthogonia,* Morr., *Agrotis* (*Noctua*) *fennica,* Tausch., and *Euxoa tristicula,* Morr. *Loxostege sticticalis* (beet webworm) and *Psylliodes punctulata* (hop flea-beetle) were both injurious to beets. When the latter is troublesome on hops, it is usual to place tarred paper beneath the vines and then brush them with a feather duster.

Malacosoma disstria (forest tent caterpillar) continued to be as troublesome as in the previous year [*R.A.E.*, A, vii, 544], and an attempt is being made to introduce a Tachinid parasite of it [*Blepharipeza*] from

British Columbia. The spruce mite mentioned in the previous report [*loc. cit.*] was apparently much less abundant on transplanted spruce, but is well established on the large native trees The bark-beetles, *Ips hudsonicus* and *I. perturbatus*, are commonly found throughout northern and western Alberta, and are estimated to cause more damage than forest fires. *Cantharis nuttalli*, Say (western blister beetle) is injurious to various kinds of beans.

Locusts were particularly troublesome in the south. *Camnula pellucida*, Scud., and *Melanoplus atlantis*, Riley (lesser migratory locust) were a serious menace to crops, while *M. bivittatus*, Say, *M. packardi*, Scud., and *Circotettix carlinianus*, Thom., were present in unusual numbers. *Plutella maculipennis*, Curt. (diamond-back moth) injured cabbages and cauliflowers. *Tortrix* (*Cacoecia*) *conflictana*, Walk. (aspen leaf-roller) was so abundant that in some districts maples were entirely defoliated, and the caterpillars then attacked elms and poplars. *Cymatophora ribearia*, Fitch (currant span-worm) defoliated all varieties of cultivated and native currants in certain districts.

McLaine (L. S.). **Two new and important Insect Pests recently found in Canada.**—*Agric. Gaz. Canada, Ottawa*, vii, no. 10, October 1920, pp. 793–794.

In August 1920 the presence of *Pyrausta nubilalis*, Hb. (European corn borer) was discovered in Canada. From July 1917 onwards, this moth has been recorded from various parts of the United States, and after its appearance in the west of New York State, attempts were made to determine whether it had invaded Canada. It was finally located in two districts, namely, along part of the shore of Lake Erie, stretching about 20 miles inland, and also in St. Thomas, Ontario. No borers were found by scouts working between these two localities.

Stilpnotia salicis, L. (satin moth) has recently been found feeding on poplars in New Westminster, B.C. This moth is found in Europe and Asia, attacking poplars and willows. It was first recorded from America in the spring of 1919, when it was found near Boston, Mass. Attempts will be made to eradicate it before it spreads further, in view of the danger to poplars and willows, which are abundant in southern British Columbia.

White (G. F.). **American Foulbrood.**—*U.S. Dept. Agric., Washington, D.C.*, Bull. 809, 10th March 1920, 46 pp., 8 plates, 9 figs. [Received 2nd November 1920.]

American foulbrood is an infectious disease of the brood of bees caused by *Bacillus larvae* [*R.A.E.*, A, ii, 530]. It is characterised by a decided ropiness of the decaying brood and a peculiar foul odour. It is widely distributed, and if not treated its effects are severe, the rule being that the colony infected sooner or later dies out as a result.

The studies on *B. larvae* here described were carried out on the same lines and with the same objects in view as those on *B. pluton* already noticed [*R.A.E.*, A, viii, 414].

Russell (H. L.) & Morrison (F. B.). **Experiments in Farming.**—*Ann. Rept. Wisconsin Agric. Expt. Sta., 1918–1919, Madison*, Bull. 319, September 1920, 76 pp., 29 figs. [Received 3rd November 1920.]

The cultivation of peas has been greatly curtailed in Wisconsin owing to the ravages of the pea moth [*Cydia ? nigricana*]. This pest was

evidently introduced some 10 or 15 years ago from Canada, and is at present confined to certain definite localities in the State, whence it is gradually extending. The losses in Door county in 1918 were estimated at 40 per cent. Hibernation occurs in the soil, where a small cocoon of soil particles is constructed, the moth emerging about mid-July. The larvae penetrate through the pea-pod and feed on the developing peas. Under the present system of cultivation, spraying is impossible. Peas that mature before 20th July, such as the early canning varieties, will probably escape injury, but as yet nothing has been done to protect the later kinds.

About one-third of the potato crop was lost owing to the presence of the potato leafhopper [*Empoasca mali*] and the condition known as "tipburn" produced by its attacks. This appears first as a slight yellowing, usually at the tip of the leaf, which spreads into a browning or curling upward of the edge. Bordeaux mixture (4 : 4 : 50) alone, or preferably with nicotine sulphate (1 : 1,200), will protect the plants from bad infestation. A fungus disease attacks both adults and nymphs, and a small Hymenopterous parasite has been bred from the eggs.

The strawberry crown miner [*Aristotelia* sp.] is apparently well established in the State. The moth oviposits on strawberry plants in the spring, and the larvae burrow into the crown or along the root, pupation occurring in the tunnels, where the winter is spent. Older beds seem to be more severely attacked than young ones. In cases of bad infestation the best plan is to plough the bed in early autumn so that the roots will dry up before the larvae mature. Spraying the plants with an arsenical solution in early spring while the young larvae are hatching might prevent their entrance to the crown of the plant, but this has not yet been tested.

LOVETT (A. L.) & FULTON (B. B.). **Fruit Grower's Handbook of Apple and Pear Insects.**—*Oregon Agric. Expt. Sta., Corvallis,* Circ. 22, April 1920, 71 pp., 41 figs. [Received 8th November 1920.]

The purpose of this small handbook is to enable the fruit-grower to distinguish the insect pests of fruit and to assist him in controlling them. The insects are classified as injuring fruit, buds and leaves, or roots, trunks, branches and twigs, and a key for identifying them is given at the head of each group. The life-history and habits of each pest is briefly dealt with, and simple practical remedies are suggested. A chart indicates the best times for remedial measures, and directions are given for the preparation of the commoner insecticides, including a simplified lime-sulphur dilution table. The value of this handbook is considerably enhanced by both the scientific and popular names of each pest being given.

HERRICK (G. W.). **The Apple Maggot in New York.**—*Cornell Univ. Agric. Expt. Sta., Ithaca, N.Y.,* Bull. 402, March 1920, pp. 89–101, 7 figs. [Received 8th November 1920.]

Rhagoletis pomonella, Walsh (apple maggot or railroad worm) is one of the more serious pests of apple in parts of New York State. Its life-history [*R.A.E.*, A, iv, 370] and distribution in the State are recorded. In New York the flies are on the wing from the middle of June to the end of July or a little later. Experiments in its control have confirmed the results obtained by previous workers [*R.A.E.*, A, vii, 212], the spray formula recommended being 5 lb. lead arsenate paste to 100 U.S. gals. water.

Spraying should be done rather thoroughly, though there is no need to coat the tree completely, as in spraying for codling moth [*Cydia pomonella*]. It seems probable that after this fly has once been brought under control, the ordinary sprays for codling moth given after the petals fall and again three weeks later may be all that are required.

HERRICK (G. W.). **Some Orchard Pests of the Past Season.**—*Proc. 2nd Ann. Meeting N.Y. Hortic. Soc.*, 1919, pp. 15–24, 4 figs. [Received 8th November 1920.]

The insects generally prevalent and destructive during 1919 included:—*Melanoplus femur-rubrum* (red-legged grasshopper), *M. atlantis* (lesser migratory grasshopper), *Pomphopoea sayi* (blister beetle) on peach trees, a bug, *Cosmopepla carnifex*, on potatoes and other plants, *Contarinia tritici* (wheat midge), *Plathypena scabra* (green clover worm), *Lema trilineata*, *Empoasca mali* (potato leafhopper), *Eriocampoides limacina* (pear slug), *Hadena fractilinea* (lined corn borer) and *Hypera punctata* (clover-leaf weevil). The apple maggot [*Rhagoletis pomonella*] is becoming increasingly important as an apple pest, and recent experience with regard to its destruction is discussed [see preceding paper]. From the latter part of June until September the red-humped caterpillar [*Schizura concinna*] and the yellow-necked caterpillar [*Datana ministra*] were rather more abundant than usual. The trees were badly defoliated, and branches thus injured often fail to survive the winter. A spray of 6 lb. of lead arsenate paste to 100 U.S. gals. of water is advocated against them, and should be applied as soon as the caterpillars are noticed, followed by a second application about two weeks later. In the case of a light infestation the caterpillars may be cut out or shaken to the ground and killed. A poison-bait consisting of 5 lb. of lead arsenate, 1 U.S. gal. of molasses and 100 U.S. gals. of water should be used as soon as the first flies of the cherry maggot [*Rhagoletis cingulata*] are seen, which is usually about the beginning of June. The second application should be made 10 days later.

For the control of apple red bugs, *Heterocordylus malinus* and *Lygidea mendax*, the addition of nicotine sulphate to the first codling moth spray just after the petals fall has given good results. In severe infestations one pint of nicotine sulphate may also be added to the spray before the blossoms open.

The false tarnished plant bug, *Lygus communis*, is recorded as occurring on apples. On pears this pest has been successfully controlled by the application of nicotine sulphate spray after the petals have fallen.

The necessity for co-operation among the various communities in regular spraying each year is emphasised.

FELT (E. P.). **Corn Borers and Grass Insects.**—*N.Y. State Mus., Albany*, [n.d.], 7 pp., 6 figs.

The pests dealt with include *Crambus luteolellus*, Clem., *C. vulgivagellus*, Clem., *C. trisectus*, Wlk., *Hadena fractilinea*, Grote (lined corn borer), *Papaipema nebris*, Gn. (*nitela*, Gn.) (stalk borer), *Heliothis obsoleta*, F. (corn ear worm), and *Pyrausta nubilalis*, Hb. (European corn borer). A key is given to facilitate the recognition of these moths, with particulars of the damage they do and general remedial measures for them.

Takahashi (R.). **On some Species of the Genus** *Nipponaphis,* **Pergande (Aphididae, Hemiptera).**—*Bull. Brooklyn Entom. Soc., Brooklyn, N.Y.*, xv, no. 4, October 1920, pp. 115–116.

The second generation (migrant) of *Nipponaphis distyfoliae,* sp. n., from Japan is here described. This Aphid produces very prominent galls on the leaves of its winter host, *Distylium racemosum,* which start about April and reach full development in May. The stem-mother is wingless, but the females of the second generation are winged, and migrate to *Quercus glandulifera* or some closely allied tree in June. The succeeding generations are wingless and non-migratory, the winged sexuparae appearing in October and November.

The genus *Nipponaphis,* of which *Schizoneuraphis* is regarded as a synonym, has been recorded only from Japan and Java. From the former country three other species are known, *N. yanonis,* Mats., *N. distylii,* Perg., and *N. cuspidatae,* Essig & Kuw., the latter being the only one with a single food-plant and not producing galls.

Pink Bollworm Act of Texas. Approved 19th June 1920.—*Texas State Dept. Agric., Austin,* 16 pp. [Received 10th November 1920.]

The text of the Pink Bollworm Act of Texas is given. The object of this legislation, as shown in the caption, is as follows :—An Act to prevent the introduction into the State of Texas of the destructive cotton pest *Platyedra* (*Pectinophora*) *gossypiella,* Saund., known as and hereinafter referred to as the pink bollworm, and to control and eradicate such insect pest when and where discovered in this State ; creating a zone along the boundary between Texas and Mexico, and providing for the inspection of fields of cotton and for general control of products in such zones ; providing for emergency quarantine of cotton or cotton products contaminated or infested with such pest and for the adequate disinfection of such cotton products ; providing for supervision of areas contaminated or infested, but in which it is not deemed necessary to destroy the cotton or fields of cotton ; providing for the condemnation, destruction and compensation of fields of cotton infested or cotton or products found to be infested ; providing for the creation, by proclamation of the Governor, of zones in which cotton may be grown under regulations, and for zones in which the growing of cotton may be declared a public menace and its production prohibited ; providing for the appointment of a Pink Bollworm Commission and prescribing it duties ; providing in the event of the establishment of non-cotton zone for the appointment of a Compensation Claim Board and describing its duties ; providing for the payment of compensation to persons who may sustain loss or damage through the operation of the Act ; defining the pink bollworm and defining "cotton" or "cotton products" ; and making an appropriation (equivalent to £20,000 at par) for the administration of the Act.

Scholl (E. E.). **Report of the Pink Bollworm of Cotton** (*Pectinophora gossypiella,* **S.**)—*Texas State Dept. Agric., Austin,* Bull. 65, March–April 1919, 459 pp., 74 figs. [Received 10th November 1920.]

The prevention of a general invasion of the cotton belt of the United States by *Platyedra* (*Pectinophora*) *gossypiella* (pink bollworm of cotton) and the extermination of local outbreaks is probably the greatest entomological problem of the southern United States.

The present report has been compiled with the object of informing the public of the status of this pest and of the work that has been done in Texas towards its eradication since its first discovery there in 1917. The life-history and habits of this moth are described, with illustrations of its work, tables showing the damage done to cotton, and maps showing the cotton growing countries of the world as well as the distribution of the insect. A short account is given of other cotton pests, and a brief notice of some insects that might be confused with *P. gossypiella*. The parasites of the pink bollworm are also discussed.

The legislation passed to prevent the importation of the pest into the United States, and the quarantine and other regulations that have been passed since its appearance, are recorded in full.

The conclusion drawn from the work and its results is that although *P. gossypiella* has actually existed in Texas for the past few years, it seems to be entirely under control at the time of writing. Attention has been drawn in the course of the work to other pests of cotton and cotton seed that require the immediate attention of entomologists. It is believed that no method other than strict quarantine measures will entirely eradicate a thoroughly established infestation of *P. gossypiella*. The study of alternative food-plants has not yet been completed, but there are indications that if successive generations of the bollworm are able to develop on other plants than cotton, such plants are few in number.

The Federal Government has helped very considerably in Texas towards the eradication of *P. gossypiella* with a large force of competent men and the expenditure of a considerable sum of money. The author suggests that it would be well for the State Legislature to make a sufficiently large appropriation so that the burden will not all fall upon the Federal officials. A grant made at the present time for eradication of the pest and for preventing the introduction of new infested material would obviously be much better than the expenditure of large sums for remedial measures should the insect become established in the United States.

In an appendix, the pink bollworm situation during 1919–1920 is discussed, and the latest resolutions for quarantine measures and the recommendations of the Pink Bollworm Commission are given [see also preceding paper].

Dutton (W. C.). **Dusting and Spraying Experiments of 1918 and 1919.**—*Michigan Agric. Expt. Sta., East Lansing*, Spec. Bull. 102, March 1920, 50 pp., 20 figs. [Received 11th November 1920.]

An account is given of the results of a series of dusting and spraying experiments conducted during two seasons, including comparisons of dusting materials, lime-sulphur solution, Bordeaux, dry lime-sulphur, and lead, calcium, and magnesium arsenates. These materials were used on apples, cherries, plums, peaches, currants and potatoes, for the control of both insects and fungi.

Apple scab and chewing insects on apple were satisfactorily controlled by the use of dusting materials. The results were equal to or better than those obtained with dilute lime-sulphur and lead arsenate. The dusting method, however, is recommended as supplementary to spraying, not as a substitute for it, as no dusting material has been developed that will completely control scale-insects.

Dusting mixtures composed of sulphur, lead arsenate and tobacco dust caused no injury to plum foliage including Japanese varieties.

On potatoes, calcium arsenate dust gave excellent results against the Colorado potato beetle [*Leptinotarsa decemlineata*]. The application can be made with an orchard duster, without any special outlet for distributing the material to each row; but for extensive work it is probably better to secure a special attachment. Calcium arsenate, however, did not always give satisfactory results when used on fruit trees. Lead arsenate is recommended for general use on all kinds of fruits; it gave uniformly better results than any other arsenate. With magnesium arsenate there is a danger of severe foliage injury to peaches and apples, and a satisfactory control of codling moth [*Cydia pomonella*] was not obtained with it.

Dusting may be done when the foliage is either wet or dry. Some growers prefer to dust at night, as atmospheric conditions are usually more favourable. There should not be much wind. The material should be applied from two directions for each application. A satisfactory method is to dust down wind on two different days when the wind is in different directions. There is usually a definite air current at night. In ordinary circumstances it is not necessary to stop at each tree.

The cost of material is higher for dusting than for spraying, but the cost of application is less. Dusting can be done much more rapidly than spraying, and consequently it is possible to cover an orchard quickly at critical times and to make extra applications when desirable. No recommendations can be made as to dilute dusting mixtures at present. Ordinary commercial sulphur is not suitable for dusting; only special dusting sulphur should be used.

Foliage injury, which has sometimes been observed when spray guns are used, can be avoided if proper care is taken. The driving spray should be used as little as possible, the trees should not be drenched, and the fine spray should always be used when covering parts of the tree close to the operator.

PETTIT (R. H.) & MCDANIEL (E.). **The Lecania of Michigan.**—*Michigan Agric. Expt. Sta., East Lansing,* Tech. Bull. 48, March 1920, 35 pp., 7 plates, 16 figs. [Received 11th November 1920.]

Of the genus *Lecanium* (*sens. lat.*) thirteen species and one variety are described, including *Toumeyella corrugatum,* Thro., on Scotch and Austrian pine and *T. corrugatum* var. *neglectum,* n., on pitch pine in New York, and *T. numismaticum,* sp. n., on Scotch pine in Wisconsin.

JACK (R. W.). **The Bean Stem Weevil. A Minor Pest of Beans.**—*Rhodesia Agric. Jl., Salisbury,* xvii, no. 5, October 1920, pp. 452–455, 2 plates. [Also published as *Rhodesia Dept. Agric., Salisbury,* Bull. 369, October 1920, 4 pp., 2 plates.]

The bean-stem weevil, *Alcides leucogrammus,* Erich., here described, occurs in various parts of Mashonaland. Its attack is apparently limited to beans of the genera *Phaseolus* and *Vigna* (French beans and cowpeas). The beetles feed on the stems and branches of the plants, and lay their eggs in cavities that they have made at the base of the stems. The larvae feed on the tissues at the base of the stem, and though a single individual may be completely enclosed in the swollen stem, when several are present considerable swelling and callus

formation result. The pupa is formed in a tough cocoon, attached to or enclosed in the stem. The beetle seems at times to remain in the cocoon for an indefinite period before emerging, particularly in the case of the later broods towards the end of the breeding season. In the height of summer the period of development up to the emergence of the adult may be as short as fifty days, but is very variable even in a given brood.

Breeding appears to be restricted to a short period of the year. The insect hibernates as an adult, buried in the ground. Egg-laying has not been observed earlier than late November. Adults from these eggs appear from the middle of January onwards and begin laying in a few days. There are probably only two generations a year, while some of the beetles appearing in January live on till next spring before ovipositing.

A plant may apparently carry one grub without actually dying, but its growth and production are seriously interfered with. Many plants are killed outright, and others become yellow and drop their leaves, dying more slowly. Damage is sometimes overwhelming in a few rows in gardens, but the weevil's capacity for increase does not seem sufficient to make it a serious field pest.

As a remedial measure all beans attacked should be pulled up and burnt as soon as their period of usefulness is over, especially during the earlier part of the season.

No parasites have been bred from the grubs, but observations in the field have indicated considerable destruction by predaceous enemies, which eat into the cocoons and devour the pupae and resting adults, and probably also the larvae. The driver ant, *Dorylus helvolus*, appears to be the chief enemy in this respect.

SWEZEY (O. H.). **Termites or White Ants in Sugar Cane.**—*Hawaiian Planters' Record, Honolulu,* xxiii, no. 4, October 1920, p. 218.

An instance of *Coptotermes intrudens*, Oshima, attacking sugar-cane is here recorded. In a single stool of cane growing in a garden, a few of the stalks were hollowed out by the termites, which had worked into the stool from below ground and on up into the stalks. They had apparently come from a badly infested fence near by.

Only once before has a similar attack by termites been recorded in Hawaii, five stools in a field having been attacked by *C. intrudens* in 1917. In both cases the attacks took place in July. An instance is also given of sugar-cane that has never been attacked though situated within a few feet of a heavily infested fence.

In March 1920 this same termite was found in maize, well grown stalks of which had been entirely eaten out.

CONNER (S. D.). **Aphids and Ants on Fruit Trees.**—*Proc. Indiana Acad. Sci., Indianapolis,* 1918, pp. 245–246.

Trees treated with sticky bands for the prevention of infestation by ants were found to be equally free from Aphids. Although Aphids can fly, they apparently depend chiefly on ants for transmission as well as protection from natural enemies. The efficacy of this treatment, tested in 1917, was proved by a subsequent trial the following year.

McDaniel (E.). **Spruce Budworm** (*Tortrix fumiferana*, **Clem.**).—*Michigan Agric. Expt. Sta. Qtrly. Bull., East Lansing*, iii, no. 1, August 1920, pp. 13–14, 2 figs.

The discovery of larvae of *Tortrix fumiferana* (spruce bud moth) in Michigan is a serious matter in view of the fact that this insect has caused the destruction of large coniferous forests both in New England and Canada.

The larvae feed on the buds and shoots of conifers, spinning them together into shelters in which they pass the winter. They pupate in nests on the terminal twigs about the end of June. The moth has a wide range, and infestation spreads rapidly. The trees attacked are fir, spruce, larch, hemlock, balsam and white pine.

Infested trees, if valuable enough, should be sprayed with lead arsenate (2½ lb. powder to 50 U.S. gals. water) soon after the young shoots open, and again a week or ten days later.

Cooley (R. A.). **Seventeenth Annual Report of the State Entomologist of Montana.**—*Montana Agric. Expt. Sta., Bozeman*, Bull. 133, December 1919, 15 pp., 1 fig. [Received 16th November 1920.]

A list is given of the commoner insect pests of 1919. *Porosagrotis orthogonia* (pale western cutworm) is now recognised as being quite as serious as *Chorizagrotis auxiliaris* (army cutworm), and destroyed over £200,000 worth of grain in 1919. It has a long period of larval feeding for about two months from the middle of April, and the damage it does is so prolonged that it makes it too late to put in a second crop of spring grain if necessary. This cutworm is not heavily attacked by parasites, and as it feeds underground, it is not affected by poison-baits or other methods of control at present known.

Grasshoppers were more than usually numerous, particularly *Eritettix tricarinata*, *Camnula pellucida* and *Aulocara elliotti*, the last-named being one of the worst insect enemies to range grass. Grasshoppers of the type of *Melanoplus atlantis*, on the other hand, were not abundant anywhere, probably because of the activities of parasitic flies [*Sarcophaga* spp.]. No parasites were observed in connection with the three species first mentioned, and it seems probable that grasshoppers will be a serious problem for several years.

Loxostege sticticalis (sugar-beet webworm) occurred in large numbers on Russian thistle in wheat fields, where it did no damage, as it does not attack wheat, but it caused real injury in gardens to beets, spinach, and a few other plants. It is capable of doing extensive damage in sugar-beet fields.

Hypera variabilis (*Phytonomus posticus*) (alfalfa weevil) will probably reach Montana in the normal course of its spread in a year or two, and become a serious pest a few years later. Meanwhile a quarantine against the whole of Idaho will be essential.

Legislative measures against American foulbrood, which has caused great loss in the State, are proposed.

Cydia (*Carpocapsa*) *pomonella* (codling moth) attracted attention, the early summer enabling a destructive second brood to develop. It will probably not be so serious in future years, but a consistent spraying programme against it and other pests and diseases should be adopted by all fruit-growers.

A leaf-roller, either *Tortrix* (*Archips*) *argyrospila* or *T.* (*A.*) *rosaceana*, which appeared in injurious numbers on apple trees, may be satisfac-

torily controlled by the use of miscible oils applied as a spray as early as possible in the spring. This pest usually occurs intermittently.

Flea-beetles were numerous, and caused rather extensive damage early in the season to tomato and potato plants and sugar-beets. Several species were noticed, the most injurious being *Epitrix subcrinita*.

Paillot (A.). **L'Immunité chez les Insectes.**—*C.R. hebdom. Acad. Sci., Paris,* clxxi, no. 16, 18th October 1920, pp. 757–759, 1 fig.

Immunity in insects is not considered to be essentially the result of a change of activity in the phagocytes, but is probably due to a series of varied reactions, in more or less close relation to each other, the intensity of which varies according to the individual, the organism inoculated, temperature, etc. These reactions jointly constitute a biological table characterised by its great complexity and variability. As a result of experiments with *Nygmia phaeorrhoea* (*Euproctis chrysorrhoea*), *Porthetria* (*Lymantria*) *dispar* and *Vanessa polychloros*, inoculated with *Bacillus melolonthae non-liquefaciens*, *B. pieris non-liquefaciens* and *B. bombycis non-liquefaciens*, it is thought that the variations in the intensity of phagocytosis is due less to a change in the sensibility of the phagocyte than to a physico-chemical modification of the substance of the microbe, and that phagocytes play no part either directly or indirectly in the granular transformation of the organism. The extracellular destruction of microbes in the blood of insects is not necessarily preceded by their granular transformation. Certain bacteria are able to resist the action of the blood and multiply actively, causing death of the host as a result of septicaemia.

Houlbert (C.). **Les Insectes. Anatomie et Physiologie générales: Introduction à l'Etude de l'Entomologie biologique.**—*Paris,* Librairie Octave Doin, 1920, 2nd Edn., 374 pp., 207 figs. Price 8 fr. paper, 10 fr. boards.

This little handbook, which forms a volume of the "Encyclopédie Scientifique," is written for those who desire a general and elementary knowledge of entomology. The history of the science up to the present day is briefly reviewed, and the anatomy, physiology and biology of insects is discussed. A section of the book deals with economic entomology, remedial measures against pests, the geographical distribution of insects and their relation to agriculture. Insect parasitism of man, animals and other insects is briefly touched upon. Under the heading of applied entomology the classification of insects is briefly explained and a table for determining the natural orders of insects is given. A bibliographic and a general index are appended.

Marchal (P.) & Foex (E.). **Rapport Phytopathologique pour l'Année 1918.**—*Ann. Service des Epiphyties, Paris,* vi, (1918) 1919, pp. 5–33. [Received 12th November 1920.]

The general lines of work of the Service des Epiphyties are outlined. The distribution of *Novius cardinalis* for the control of *Aulacaspis* (*Diaspis*) *pentagona* was continued.

The following pests were intercepted in material for export to the United States:—*Nygmia phaeorrhoea* (*Euproctis chrysorrhoea*), *Porthetria* (*Liparis*) *dispar, Aporia crataegi, Acronycta rumicis,* and *Anthonomus rectirostris* (*druparum*), the last-named being found in seeds of *Cerasus avium*.

Among the insects reported during 1918 *Pegomyia hyoscyami* (beet-fly) was unusually prevalent in Brittany and also in the Paris district, and was a serious danger to the beet industry; this fly, however, seldom does much damage after the first generation, and therefore the crop is able to recover.

Vegetables were damaged by cutworms (*Agrotis*), and it was found that dipping the young plants in Bordeaux mixture as well as spraying them has given good results; *Pionea forficalis* injured cabbages and cauliflowers; the Tortricid, *Cydia* (*Grapholitha*) *leplastriana*, Curt., which is very injurious in Italy, has been recorded from Niort, but does not seem to be very widespread in France; *Agromyza abiens* (artichoke fly) was much less abundant than in previous years. Beans were severely attacked by *Lixus algirus* and *Sitones lineatus*.

Larvae of *Hyponomeuta* were very numerous on apple-trees in many regions, and plums were much injured by *H. padella*. Besides *Anthonomus pomorum*, which was prevalent as usual on apple-trees, pear-trees have been severely attacked by *A. pomorum* on the flower buds, *A. pyri* on the flower clusters and *A. spilotus* on the leaves. Pears were also heavily infested in the Paris district by the Cecidomyid, *Contarinia* (*Diplosis*) *pyrivora*. The infested fruit should be gathered directly after the blossoming period.

Olives were attacked by *Dacus oleae* (olive fly), *Euphyllura oleae* (olive psylla) and in the Drôme region by *Prays oleellus* (olive moth). Forest-trees were attacked by processionary caterpillars [*Cnethocampa processionea*], elms by *Galerucella luteola*, and pines by *Hylesinus piniperda* and *Rhyacionia* (*Evetria*) *buoliana* (pine-shoot moth). Among ornamental plants, rhododendrons were heavily infested with *Stephanitis rhododendri*, Horv., and violets with *Perrisia affinis*.

Picard (F.). **La Faune entomologique du Figuier.**—*Ann. Service des Epiphyties, Paris*, vi, (1918) 1919, pp. 34–174, 36 figs. [Received 12th November 1920.]

This work is a review of the insect pests of fig-trees in Hérault. Those dealt with include the Curculionids, *Choerorrhinus squalidus*, Frm., and *Rhyncolus punctatulus*, Boh. The Scolytid, *Hypoborus ficus*, Er., is of primary importance, and a description of it and its life-history are given. Parasites and other enemies of this beetle include *Sycosoter lavagnei* Pic. & Licht., *Nemosoma elongatum*, L., *Brontes planatus*, L., *Laemophloeus hypobori*, Perris, *L. ater*, Ol., *Cephalonomyia hypobori*, Kieff., various Chalcids, a mite *Pediculoides ventricosus*, Newp., and *Cecidomyia* spp.

Bostrychid and Anobiid pests include *Sinoxylon sexdentatum*, Ol., parasitised by *Monolexis lavagnei*, Pic.; *Scobicia chevrieri*, Villa, parasitised by *Dendrosoter ferrugineus*, Marsh., *Spathius rubidus*, Rossi, and *Parascleroderma scobiciae*, Kieff.; *Xylonites praeustus*, Germ., and *X. retusus*, Ol.; *Anobium striatum*, Ol., parasitised by *Spathius pedestris*, Wesm.; *Gastrallus laevigatus*, Ol., parasitised by *Cerocephala cornigera*, Westw.; *Ptinus lichenum*, Marsh., and *P. bidens*. Cerambycid pests include *Hesperophanes griseus*, F., an important pest of which the description and biology are given, the parasites being *Xylonomus propinquus*, Tschk., *Sycophrurus hesperophanis*, Pic., and *Iphiaulax flavator*, F.; *H. fasciculatus*, Fald., *H. cinereus*, Vill., and *H. sericeus*, F.; *Clytus pilosus*, Forst., with its parasites *Doryctes leucogaster*, Nees, *Pristaulacus chlapowskii*, Kieff., and *Opilo domesticus*, Strm.; *C. arietis*, L., *C. arvicola*, Ol., *C. rhamni*, Germ., and *C. sartor*, Müll.; *Gracilia*

minuta, F., *Leptidea brevipennis*, Muls., and *Necydalis ulmi*, Chev.; *Pogonochaerus dentatus*, Four., *Haplocnemia curculionoides*, L., *Niphona picticornis*, Muls., and *Dorcatypus tristis*, L.

Other wood-inhabiting insects include *Calotermes flavicollis*, F., ants, Vespids, etc.; those attacking the leaves include the Lepidoptera, *Arctia caja*, L., *Simaethis nemorana*, Hb., with its parasites *Pimpla erythronota*, Kriechb., *Apanteles sicarius*, Marsh., and *Stenomesius rufescens*, Rossi; the Rhynchota:—*Homotoma ficus*, Guér., with its enemy *Rhopalum clavipes*, L.; the Jassids, *Typhlocyba rosae*, L., and *Empoasca* (*Chlorita*) *flavescens*, F.; the Fulgorid, *Hysteropteron grylloides*, F.; the scales, *Lepidosaphes ulmi*, L. (*conchiformis*, Gmel.), *Saissetia oleae*, Bern., *Coccus* (*Lecanium*) *hesperidum*, L., and *Ceroplastes rusci*, L., the enemies of which are *Eublemma* (*Thalpochares*) *scitula*, Ramb., *Scutellista cyanea*, Mot., and *Spilomena troglodytes*, Lind.

Insects found in the figs themselves include *Blastophaga psenes*, L., *Philotrypesis caricae*, Hass., and certain Diptera and Orthoptera.

It is noticeable that it is generally specific pests that are most injurious to fig-trees, which is contrary to the case of the vine. Fig-trees are ubiquitous, but occur singly, and cultivation is generally non-existent where they are grown. While most of the pests occur both on "caprifico" and cultivated figs, *Blastophaga psenes* and *Philotrypesis caricae* are not adapted to cultivated figs, on which they are replaced by the Diptera common to all pulpy fruit, notably by *Ceratitis*.

Parasites are an important consideration with regard to fig pests, and it is obvious that many of them have a very lengthy larval period and frequently develop at the expense of hosts that are in the second year of their life-cycle. The conclusion is reached that, though parasites constitute periodically an obstacle to the multiplication of certain species, they do not as a whole ever multiply to such an extent as to overwhelm their hosts.

Arnaud (G.). **Maladies nouvelles ou peu connues en France. Série ii.**—*Ann. Service des Epiphyties, Paris*, vi, (1918) 1919, pp. 214–227, 11 figs. [Received 12th November 1920.]

In the course of this discussion of plant diseases in France it is mentioned that the disease known as "silver leaf" of the laurel, *Viburnum tinus*, is caused by the punctures of a thrips, probably *Heliothrips haemorrhoidalis*. This disease greatly lowers the vitality of the plant and may even cause its death; it has occurred in Montpellier for the past 10 years, but its cause was not previously understood.

Lesne (P.). **Un Chalcidide nuisible à l'Amandier dans la Région Syrienne.**—*Ann. Service des Epiphyties, Paris*, vi, (1918) 1919, pp. 228–241, 14 figs. [Received 12th November 1920.]

The Chalcid, *Eurytoma amygdali*, is a serious pest of almonds in certain parts of Syria. A description of the insect is given that completes and rectifies in certain points the original one by Enderlein in 1907, and includes a description of a mature larva. The habits of and injury caused by the pest are described, largely from Aharoni's account [*R.A.E.*, A, v, 374]. A Chalcid has been reared in Paris from almonds sent from Palestine that is believed to be a parasite of *E. amygdali*. The only individual obtained is imperfect and cannot therefore be identified, but a description of it is given. Another enemy is a spider that enters the almond before *E. amygdali* has emerged and devours it.

In spring, during the period of oviposition, repellent mixtures should be sprayed on the trees, followed by insecticide sprays when necessary during the hatching period. In summer and autumn the fallen almonds and the infested ones remaining on the tree should be collected and put into receptacles screened with a 1 mm. mesh to allow the emergence of parasites.

MARCHAL (P.). **Les Traitements Arsenicaux et les Traitements mixtes des Arbres Fruitiers.**—*Ann. Service des Epiphyties, Paris,* vi, (1918) 1919, pp. 242–280. [Received 12th November 1920.]

In continuation of the work of previous years [*R.A.E.*, A, vii, pp. 462–464], various treatments have been given against pests of fruit-trees. The substances and manner of application in use in America are described and contrasted with the French methods, and many formulae are given for simple insecticide and combined mixtures.

The conclusions reached by the work achieved up to the present are discussed. It is agreed that the earliest measure against *Cydia* (*Carpocapsa*) *pomonella* (codling moth) should be given at the moment of the fall of the petals, or immediately after, care being taken to fill the calyx with the spray, as this is the most usual point of entry of the larva into the fruit. In 1917, moths of the second generation emerged on 16th August from infested apples gathered in July; it is probable that in northern France the second generation is only a partial one, and less important than the first. Accurate information on this point is desirable, but it is probable that the second generation influences only the quality and not the quantity of the fruit, and therefore is not of much importance in cider districts. This generation is controlled in America by later sprays, which, however, are forbidden in France by legislation. Some growers prefer to spray apple-trees when in full bloom. For pears, in which the calyx cup frequently remains open, the first treatment may be made comparatively late.

Lead arsenate has proved the most successful of all insecticides, and is used sometimes at as much as double the strength of the American formula, owing to the fewer treatments that can be applied. A commercial preparation, equivalent to 3 lb. sodium arsenate *plus* 9 lb. lead acetate per 100 gals. water, used in Gironde in 1917, produced more than double the quantity of apples compared with untreated trees when a single application was given at the time the blossoms fell, and nearly three times the quantity when a second application was given a fortnight after the first. Lead arsenate is not only efficacious against *C. pomonella* and *C. funebrana* (on plums), but also against foliage pests, such as *Cheimatobia brumata*, *Hyponomeuta* spp., the larvae of which die in 8 to 15 days after spraying, and *Malacosoma neustria*, which also dies within a few days.

The action of various mixtures on the plants is discussed. It is said that lead arsenate mixtures are not only harmless to the plant, but even stimulate its growth. The advantage to be gained by arsenical treatments is considered; in the case of table fruit the profit to be derived in consequence of better quality fruit has already been proved; it remains to be determined exactly which treatments will give the maximum results that are obtained normally in the United States and in Canada.

Vayssière (P.). **Les Sauterelles dans le Sud-est de la France en 1918.**—*Ann. Service des Epiphyties, Paris*, vi (1918) 1919, pp. 289–298, 3 figs. [Received 12th November 1920.]

In view of the serious losses from various Orthoptera in the south-east of France during 1918, a study has been made of the conditions in those regions and of methods for combating the invasions in future years. The principal species observed was *Dociostaurus* (*Stauronotus*) *maroccanus*, Thunb., which began to appear from 1st to 15th May. The crops that suffered most were lucerne and spring cereals (oats and barley), of which more than half the crop was damaged. *Calliptamus italicus*, L., *Oedipoda coerulescens*, L., and *O. miniata*, Pall., appeared in almost equal numbers wherever they were prevalent, occurring from the end of June or early July. Vegetable crops and pasturage were both severely attacked. *Ephippiger provincialis*, Yers., and *E. vitium*, Serv., are essentially pests of vines and vegetable crops, and reach their maximum numbers in July. Oviposition occurs in loose soil in exposed places. *Barbitistes fischeri*, Yers. (*berenguieri*, May.) breeds in the forests of the Chaîne des Maures, and becomes adult in summer. In certain years it is unusually abundant, and descends to the fields, severely damaging the crops, including vines, cereals, fruit and ornamental trees, as well as wheat. *Decticus albifrons*, F., is chiefly predaceous on other Orthoptera, vegetable food being a secondary consideration. In one locality, however, it completely devoured the first crop of figs.

In studying the methods of control of locusts it must be remembered that the various species have different habits. It is useless at present to attempt to protect the forest trees. While these Orthoptera breed in large masses, the Tettigoniids oviposit in isolated places, frequently depositing a single egg wherever suitable ground occurs. The Moroccan locust alone has been successfully controlled by the use of tents, but this method is impracticable in the forest regions in question. An outstanding feature of the remedial measures advocated in different countries is the importance assigned to insecticide treatments, mechanical methods being a secondary consideration. It is not known what value should be attached to the biological method of control by *Coccobacillus acridiorum*, d'Hérelle, as it has not been tried on the native species, except perhaps *D. maroccanus*; it would be interesting to have further information on this point.

Some success has been obtained in the districts liable to invasion by spraying the young locusts with a mixture of 15 to 20 lb. crude oil of coal-tar, 1 gal. spirits of wine, 5 lb. sodium carbonate and sufficient water to make 25 gals. Arsenical salts and arsenious acid are recommended as producing the best results, and it is considered unnecessary to enter into a discussion of other well-known but less efficacious treatments.

In dealing with locusts, the breeding-places should be searched for at the beginning of spring, and the young stages and the plants on which they feed should be sprayed with an arsenical solution. As soon as the first hoppers appear in the undergrowth near plantations, poison-bait should be spread around the cultivated areas, especially those bordering on woods, and insecticides should be sprayed over the grasses and bushes at the edge of the fields. The formulae for various preparations of this nature are given [*R.A.E.*, A, iv, 6, etc.]. The poison-baits can be used on any kind of plants or pasture-land, and are efficacious against all stages of locusts.

It is suggested that a syndicate should be formed on the lines of that inaugurated in 1914 [*R.A.E.*, A, vii, 466] to deal in a co-operative manner with locust invasions.

MOREAU (L.) & VINET (E.). **Les Pièges-Appâts dans la Lutte contre la Cochylis.** [Bait-traps in the Campaign against *Clysia ambiguella.*]—*Ann. Service des Epiphyties, Paris,* vi (1918), 1919, pp. 299–312, 2 plates. [Received 12th November 1920.]

Recent experiments with bait-traps for *Clysia ambiguella* in French vineyards have only served to confirm the authors' opinion expressed in 1913, that while they have undoubtedly some value in protecting vines against this moth, they cannot be regarded as anything more than a complementary measure [*R.A.E.*, A, ii, 16]. The experiments here described have led to the conclusion that the liquid used in a bait-trap must have some odour if it is to have any attraction for the moths. The addition of a roof-shelter to the traps is not necessary. The maximum number of moths is caught shortly after sunset, and there is a gradual decrease after 10 p.m. The number of females caught is on an average 65·1 per cent. of the total. Atmospheric conditions have an important influence on the numbers captured. The traps are not uniform in their captures, and it is necessary to take various factors into consideration in determining their value. The degree of protection conferred upon vines by bait-traps is estimated, judging by the authors' own experiments, at 37·8 per cent. reduction in the number of larvae in the spring and 24·8 per cent. in the number of infested grapes in the summer. This latter figure is practically the same as that calculated in 1913, viz., 26 per cent.

These observations explain, in a great measure, the contradictory results that have been obtained by various experimenters, and demonstrate the necessity of detailing the technique employed in any tests, the climatic conditions under which they were carried out, and also the method employed in calculating their efficacy.

FEYTAUD (J.). **Essais de Traitements Arsenicaux tardifs contre l'Eudémis.** [Experiments in late Arsenical Treatments against *Polychrosis botrana.*]—*Ann. Service des Epiphyties, Paris,* vi, (1918) 1919, pp. 313–319. [Received 12th November 1920.]

Experiments in the control of *Polychrosis botrana* indicate that arsenical applications made after blossoming, for the control of the first generation, cannot replace preventive treatments, which give the best results. These late applications, although almost useless against the first infestation of larvae, exercise considerable control against the second generation, which damages the vines towards the end of July and beginning of August. Their efficacy against the second generation is, however, very inferior to that of a preventive nicotine treatment made towards the end of July. It is pointed out that the measures adopted in France differ essentially from those made against *P. viteana* in America, where the biology and conditions are both different.

In view of the legislation restricting the use of arsenicals in France [*R.A.E.*, A, v, 47, etc.] it is suggested that an arsenical or nicotine preventive treatment should be given before the blossoming to destroy the eggs and larvae of the first generation, this being followed by a preventive nicotine treatment against the eggs and larvae of the second generation. A complementary treatment of nicotine, pyridine or pyrethrum, in the form of a liquid pressure spray, might be given during the blossoming period to destroy the larvae while infesting the flowers.

Rapports sommaires sur les Travaux accomplis dans les Laboratoires et Comptes Rendus des Missions d'Etudes.—*Ann. Service des Epiphyties, Paris*, vi, (1918) 1919, pp. 336–351. [Received 12th November 1920.]

The work of the entomological and pathological stations at Paris, Bordeaux, Montpellier, Saint-Genis-Laval and Cadillac during 1918 is reviewed. *Cryptolaemus montrouzieri*, the Coccinellid that has been found so efficacious in the control of scale-insects in California [*R.A.E.*, A, vii, 61], has been introduced into France, and is being reared in considerable numbers, chiefly as a check on scales of the genus *Pseudococcus* (*Dactylopius*). Attempts are also being made to acclimatise a Braconid parasite of the potato moth (*Phthorimaea operculella*) introduced from California ; this parasite cannot as yet be considered to be established, but conditions appear favourable to it.

Experiments in fumigation for the control of *Stephanitis rhododendri*, which is a serious pest to the horticulturists around Paris, indicate that adult and larval stages of this bug can be completely destroyed, without any injury to rhododendron bushes, by the following procedure. Bushes of approximately 8 cubic metres were covered by a tent measuring 6 square metres and exposed for one hour to hydrocyanic acid gas produced by placing in 22 c.c. of water 11 grammes of sulphuric acid and 7 grammes of cyanide of potassium. The treatment was given in the evening at a temperature of about 65° F. Any weaker fumigation than this only gave rise to a comatose condition from which the insects quickly recovered.

In the course of measures against the oblong scale (*Eulecanium persicae*), and against *Chionaspis euonymi* and *Pulvinaria floccifera*, which are frequently found associated with it, the destructive influence of heat and dryness on scales and certain other insects, particularly *Clysia ambiguella*, was apparent.

Scolytus rugulosus, Ratz., which is generally known as a pest of apples and has not apparently been previously recorded as occurring in the Rhône valley, has been the cause of the death of a number of apricots. The work of this beetle is frequently mistaken for that of *Xyleborus dispar*, which, however, was not observed in the region. A Hymenopterous parasite of the larvae has been noticed, and a study of both is being made.

Observations are recorded on the effect of gases from a powder factory (chiefly nitrogenous) on the neighbouring vegetation. In places where the gases were borne by the wind there was no noxious effect on the crops. On vines, however, that had been sprayed with copper solution, wherever the copper had touched them the vines were scorched and dried. Both flowers and fruit were completely withered in consequence.

FULMEK (L.) & STIFT (A.). **Ueber im Jahre 1918 erschienene bemerkenswerte Mitteilungen auf dem Gebiete der tierischen und pflanzlichen Feinde der Kartoffelpflanze.** [Communications of Value published in 1918 concerning the Animal and Vegetable Enemies of the Potato.]—*Centralbl. Bakt. Parasit. u. Infektionskr., Jena*, IIte Abt., lii, no. 4–8, 21st October 1920, pp. 81–100.

This is a comprehensive review of the literature on the subject for 1918.

Eckstein (K.). **Beiträge zur Kenntnis des Hausbocks,** *Hylotrupes bajulus,* **L.** [Contributions to the Knowledge of *H. bajulus.*]—*Zeitschr. f. Forst -u. Jagdwes.*, lii, 1920, pp. 65–89. (Abstract in *Centralbl. Bakt., Parasit. u. Infektionskr., Jena,* IIte Abt., lii, no. 4–8, 21st October 1920, pp. 136–137.)

Hylotrupes bajulus, L., infests the timber of conifers; its presence in that of deciduous trees is not yet proved. It is usually found in beams, less often in furniture. The larvae destroy the wood so thoroughly as to threaten the very existence of the buildings involved. The flight period of the beetles extends from mid-June to the end of August. The eggs are deposited singly in cracks. The mines extend in the sapwood up to just beneath the surface, a skin about ½ mm. thick being left, and the interior of the beam being rendered spongy in appearance. Pupation takes place in a larval mine. The larvae are long-lived, the adults appearing from 3 to 11 years after oviposition. The adults remain for 5–7 months in the wood before their flight period, death occurring about 14 days later. Painting with carbolineum is a useful protective measure.

Burke (H. E.). U.S. Bur. Entom. **The Pacific Oak Twig-girdler.**—*Jl. Econ. Entom., Concord, N.H.*, xiii, no. 5, October 1920, pp. 379–384.

The Buprestid, *Agrilus angelicus,* Horn, causes serious damage to oaks (*Quercus agrifolia*) in California. It also attacks interior live oak (*Q. wislizeni*), leather oak (*Q. durata*), canyon live oak (*Q. chrysolepis*), mesa oak (*Q. engelmanni*), California black oak (*Q. californica*) and tan oak (*Q. densiflora*). It is found from a few feet above sea-level to an altitude of 6,000 ft. The eggs are generally laid singly on the smooth bark of the twig near the end of the last year's growth at the end of June or beginning of July. They hatch in from two to three weeks, and the larvae begin boring under the bark. The complete life-cycle requires about two years. By the middle of the first winter the mine extends down the small twigs for about one to three inches. Some of the larvae may reach the wood, whilst others still remain in the bark. Mining is continued in the following spring and summer, the length of the burrow being increased to from 6 to 12 inches. The winter is passed in the centre of the branch. In the succeeding spring the burrow is lengthened by an inch or two, after which the larva turns and retreats for several inches before entering the wood to form the pupal cell, usually about the middle of May. The adults remain for several days in the pupal cell before emerging in May and June.

The natural enemies of this beetle include the following Hymenopterous parasites:—*Cryptohelcostizus rufigaster,* Cushm., *Cryptoideus fasciatus,* Ashm., *Doryctes maculipennis,* Rohw., *Callihormius* sp., *Ptinobius agrili,* Rohw., reared from the larvae, *Metapelma spectabilis,* Westw., which may be a hyperparasite, *Tetrastichus anthracinus,* Ashm., of which as many as 17 larvae have been found in one larval host, and *Dinotus agrili,* Rohw.

The remedial measures advocated include pruning about April before the beetles emerge. These prunings should be placed in a box or barrel covered with a 16 mesh wire screen to permit the escape of the parasites. Poison and contact sprays exercise a certain amount of check by poisoning the beetles as they feed, but not sufficient to warrant their use against this beetle only.

Herrick (G. W.). **Field Experiments for the Control of the Apple Maggot.**—*Jl. Econ. Entom., Concord, N.H.*, xiii, no. 5, October 1920, pp. 384–388.

The apple maggot [*Rhagoletis pomonella*] is very destructive in the Hudson River Valley and in Columbia county, New York, where it is one of the major apple pests. Spraying with 3 lb. powdered lead arsenate to 100 U.S. gals. water about the 30th June and again about the 17th July has proved a successful remedial measure. The results of experiments show that all apple trees liable to infestation should be sprayed to prevent any migration of the flies from untreated varieties. All derelict trees should be thoroughly sprayed, or cut down and burned.

Wellhouse (W. H.). **Wild Hawthorns as Hosts of Apple, Pear and Quince Pests.**—*Jl. Econ. Entom., Concord, N.H.*, xiii, no. 5, October 1920, pp. 388–391.

The necessity for treating or destroying wild hawthorns (*Crataegus*) in the vicinity of orchards is emphasised. Owing to the almost identical habitat and botanical relationship between hawthorn and the cultivated apple, pear and quince, many insects infesting it migrate to the cultivated hosts.

The most important species in this respect include *Anthonomus nebulosus*, Lec. (hawthorn blossom weevil), the habits and life-history of which are identical with those of the apple blossom weevil of Europe [*A. pomorum*]; the Cosmopterygid, *Blastodacna curvilineella*, Chamb. (hawthorn fruit-miner); the leaf bug, *Lygus univittatus*, Knight; *Macrosiphum crataegi*, Mon.; *Argyresthia oreasella*, Clem.; and the leafhoppers, *Empoa querci*, *Lamenia vulgaris*, *Erythroneura obliqua* and *Idiocerus provancheri*.

The popular belief that the round-headed apple-tree borer, *Saperda candida*, and the codling moth, *Cydia pomonella*, are common feeders on *Crataegus* has not been confirmed.

Peterson (A.). **Some Studies on the Effect of Arsenical and other Insecticides on the Larvae of the Oriental Peach Moth.**—*Jl. Econ. Entom., Concord, N.H.*, xiii, no. 5, October 1920, pp. 391–398.

A series of experiments has been conducted under laboratory conditions to ascertain the effect of arsenicals on the larvae of *Cydia* (*Laspeyresia*) *molesta*, Busck. The technique employed is described, and the results show that dusts are superior to sprays for combating this moth, though in no case was there a complete control. Small larvae were killed by applying to the fruit a dust consisting of 1 part lead arsenate, and 5 parts hydrated lime or 1 part of finely ground sulphur. The latter mixture is the more effective of the two. Calcium and magnesium arsenates alone or in combination with hydrated lime killed almost the same percentage of larvae as the lead arsenate. Dust of hellebore, tobacco and pyrethrum did not keep the larvae out of even thoroughly coated fruit, although pyrethrum apparently has a slightly repellent effect. It was thought that spraying the twigs might poison the larvae as they eat their way out, but the results of these tests were not promising. Owing to lack of material the effect of sprays on newly-hatched larvae could not be ascertained, but they are probably more susceptible than the larger ones; in this case it may be possible to kill them all as they enter the fruit or twigs by thoroughly dusting them.

METCALF (Z. P.). **Dipping Tobacco Plants at Transplanting Time for the Control of the Tobacco Flea Beetle** (*Epitrix parvula*, **Fabr.**).—*Jl. Econ. Entom., Concord, N.H.*, xiii, no. 5, October 1920, pp. 398–400.

The losses caused by *Epitrix parvula*, F. (tobacco flea-beetle) may be greatly reduced by dipping the leaves, before transplanting, into a solution of 1 lb. of powdered lead arsenate to 10 U.S. gals. of water. The moisture should be shaken from the leaves, leaving them covered with white powder when dry.

FENTON (F. A.) & HARTZELL (A.). **The Life History of the Potato Leafhopper** (*Empoasca mali*, **Le Baron**).—*Jl. Econ. Entom., Concord, N.H.*, xiii, no. 5, October 1920, pp. 400–408, 1 fig.

Owing to the connection of *Empoasca mali*, Le B., with hopper-burn, extensive observations on its life-history have been made.

Hibernation takes place in the adult stage. The leafhoppers become active again about April, and may be found on weeds—yellow dock (*Rumex crispus*) being a favourite food-plant—until June. Early in that month these adults migrate to early planted potatoes, and begin ovipositing. The eggs hatch in from 10 to 15 days, but under laboratory conditions an average of 7 days only was required. A general migration from early to late potatoes was noticed in July, and by August the majority of nymphs had become adult. In July the nymphs may mature in about a week, but in cooler weather this stage may last as much as 26 days. The adults of this summer generation are most abundant about 10th July. The eggs laid by them hatch towards the end of August and beginning of September, giving rise to the second generation. Many of the resulting adults live until the following August, a period of about 11 to 12 months. This generation does not oviposit until the spring. The total life-cycle is thus 10 weeks for the first generation, and over a year for the second generation. Attempts to produce a third generation failed under laboratory conditions.

DUDLEY (J. E.). U.S. Bur. Entom. **Control of the Potato Leafhopper** (*Empoasca mali*, **Le B.**) **and Prevention of "Hopperburn."**—*Jl. Econ. Entom., Concord, N.H.*, xiii, no. 4, October 1920, pp. 408–415, 1 plate.

Observations show that one adult or nymph of *Empoasca mali*, Le B., is sufficient to produce decided symptoms of hopper-burn. Although this leafhopper appears on a variety of plants, it is apparently only capable of reproduction on potato, beans, hemp, apple, *Dahlia* and hollyhock. A disease similar to the hopper-burn of potatoes has been found on these plants and also on raspberry and box elder. Field observations show that, on potato at least, the extent of disease is in close relation to the number of leafhoppers present. Certain varieties of potatoes with tender foliage are apparently preferred, and these are more susceptible. The disease also affects the potato tuber, but in what way has not yet been determined. Plants grown from seed from the diseased crop of the previous year are evidently more susceptible, as they were seriously damaged in spite of spraying.

The materials tested as sprays include kerosene emulsion, nicotine sulphate, Bordeaux mixture and a combination of the last two.

Bordeaux mixture alone or combined with nicotine sulphate (1–1200) appear to be of equal value in protecting the foliage from disease. At least three applications should be made; the first when the leaf-hoppers are abundant, the second about 10 to 14 days later, and the third about two weeks after the second, but depending on the amount of new growth infested. A fourth application should be made in hot dry seasons when there is heavy new growth in late summer, and a great abundance of leafhoppers and also other potato diseases. An arsenical may be combined with the spray for the control of leaf-eating insects.

The natural enemies of *Empoasca mali* include a Hymenopterous parasite, probably a Dryinid, which attacks the eggs, and a fungus, *Entomophthora sphaerosperma*, which attacks both nymphs and adults. This latter greatly reduced the infestation in the northern sections.

HAWLEY (I. M.). **Injuries to Beans in the Pod by Hemipterous Insects.**—*Jl. Econ. Entom., Concord, N.H.*, xiii, no. 5, October 1920, pp. 415–416, 1 plate.

Observations show that the deformations found on beans, varying from circular depressed areas with a dark spot in the centre to ragged holes in which the bean coat is badly damaged, are chiefly due to injury caused by the bug, *Adelphocoris rapidus*, Say. Such deformations may also be caused by the Pentatomid, *Euschistus variolarius*, P. de B. (spined tobacco bug), and *Lygus pratensis*, L. (tarnished plant bug). The apple leafhopper, *Empoasca mali*, Le B., was also present on beans in the field, but apparently is unable to do similar injury.

WADLEY (F. M.). U.S. Bur. Entom. **The Squash Bug.**—*Jl. Econ. Entom., Concord, N.H.*, xiii, no. 5, October 1920, pp. 416–425.

The squash bug, *Anasa tristis*, De G., is found practically everywhere on squashes and pumpkins in the United States, Mexico, Central America and Canada. The chief damage is done in late summer, when the weather is hot and dry and the nymphs are most numerous. Its feeding and the toxic effect of its bites cause withering of the leaf, and after the death of several leaves the whole plant may wilt. When the normal food-plants become overcrowded or exhausted, cucurbits may be attacked, although this bug is essentially a pest of squashes and pumpkins.

Hibernation occurs in the adult stage, the mature bugs living from nine to twelve months. There are probably two generations throughout the maize belt, but in the south, three or more generations may be expected. In the extreme south it might be possible for the nymphs to withstand the winter, but in severer climates they succumb to the cold.

General activity begins with the first warm summer weather early in June, and oviposition continues until the females die. An average of 10 eggs a day may be deposited by one individual. They are placed in clusters on the side of the leaves. The incubation period varies from 7 to 9 days, but in cool weather may extend to 17 days. The nymphs are gregarious, and are found on the under-surface of the leaves. The older nymphs may be seen on the stems. The different instars vary from 2 to 3, 4 to 8, 6 to 11, and 14 days respectively, making a total of 26 to 36 days. The instars may be longer in very cold weather. Adults of the first generation were first noticed in July and continued

until October; those of the second generation appeared about 20th August. A few eggs are laid by these adults, but the resulting nymphs probably perish before becoming mature. The last adults were seen in November.

In Kansas lack of food and cold are the principal checks on this pest. Artificial remedial measures include cultural methods, hand-picking of adults and eggs early in the season, and spraying.

Of various contact insecticides tested, fish-oil soap ($\frac{1}{4}$ lb. per U.S. gal.) with sulphur (1 to 2 oz.) proved the most effective. Care must be taken to keep the sulphur in suspension. Spraying should be postponed until the nymphs are numerous. Under 1918 conditions the cost of spraying amounted to about £5 per acre.

SMITH (H. E.). U.S. Bur. Entom. **Broom Corn, the probable Host in which** *Pyrausta nubilalis*, **Hubn., reached America.**—*Jl. Econ. Entom., Concord, N.H.*, xiii, no. 5, October 1920, pp. 425–430.

The first record of the presence of *Pyrausta nubilalis*, Hb., in America was from specimens reared from *Dahlia* stems in Massachusetts in 1916, the site of infestation being close to two broom factories. From the data collected with reference to the importation of broom corn [*Andropogon sorghum technicus*] this crop appears to be the vehicle in which *P. nubilalis* reached the continent.

HINDS (W. E.). **Bean Ladybird.**—*Jl. Econ. Entom., Concord, N.H.*, xiii, no. 5, October 1920, pp. 430–431.

The bean Coccinellid, *Epilachna corrupta*, Muls., is recorded from Alabama, where cowpeas have proved to be an alternative food-plant. This beetle was probably introduced in either lucerne or beans grown in the infested territory in Arizona, New Mexico and Colorado. As it is able to withstand ordinary climatic conditions of both winter and summer, its spread throughout the south-eastern States is to be feared. Investigations into the life-history and remedial measures in the field have already been started.

DAVIS (J. J.). **The Green Japanese Beetle** (*Popillia japonica*).—*Jl. Econ. Entom., Concord, N.H.*, xiii, no. 5, October 1920, p. 432.

Attention is drawn to the occurrence of *Popillia japonica* (green Japanese beetle) in Pennsylvania. The source of the infestation is not known.

KING (J. L.). **Round-headed Apple Tree Borer injuring Apple Fruits.**—*Jl. Econ. Entom., Concord, N.H.*, xiii, no. 5, October 1920, pp. 432–433.

Adults of *Saperda candida* are recorded as injuring apple fruits in Pennsylvania. Under laboratory conditions, if confined exclusively with apples, these beetles will also oviposit on the fruits.

STEAR (J. R.). **Flea-beetle Injury to Apples.**—*Jl. Econ. Entom., Concord, N.H.*, xiii, no. 5, October 1920, p. 433.

The flea-beetle, *Nodonota puncticollis*, Say, has caused considerable injury to apples in Pennsylvania by feeding on the fruit and occasionally also on the leaves. It was first noticed on 2nd June and was very

abundant by the 14th. The infestation was serious enough to warrant the application of Bordeaux mixture and lead arsenate. The beetles were also found in large numbers during June on many of the common weeds.

GUYTON (T. L.). **The Chrysanthemum Gall Midge,** *Diarthronomyia hypogaea,* **F. Loew.**—*Ohio Agric. Expt. Sta., Wooster,* Bull. 341, May 1920, pp. 103–114, 7 figs. [Received 16th November 1920.]

Diarthronomyia hypogaea [*R.A.E.*, A, v, 14] was first reported on chrysanthemums in Ohio in 1918. In greenhouses the length of its life-cycle is from 40 to 50 days. Experiments indicated that it can be successfully controlled at the time of the emergence of the adult by spraying with a solution made of 1 part nicotine-sulphate solution containing 40 per cent. nicotine to 500 parts of water, with 1 oz. of fish-oil soap added to each gallon of the solution. This must be repeated every four or five days as long as any living forms of the midge remain in the galls. An attempt must be made to cover every gall on the plant on both sides of the leaves.

To prevent the introduction of infestation into a greenhouse, new stock should be carefully inspected, and if possible, kept in a separate room for some time, where developing galls should be carefully watched for. Where the infestation is confined to a few plants, the safest treatment is to burn them as soon as discovered.

COOLEY (R. A.). **Department of Entomology.**—*26th Ann. Rept. (1918–19) Montana Agric. Expt. Sta., Bozeman,* February 1920, pp. 27–29. [Received 16th November 1920.]

Grasshoppers are the most persistently destructive of the farm insect pests in Montana. They are present in injurious numbers every year, and at times become so numerous that green vegetation over entire districts is liable to destruction.

Attempts have been made to find a cheaper form of the usual poison bran mash, which is recognised as affording the most successful remedial measure. It was found that finely powdered crude white arsenic is as efficient as Paris green, which costs at least five times as much. One ounce of amyl acetate replaces eight oranges or lemons, and with the grasshopper tested during the experiments, is far more effective. It is also much easier to transport and prepare. There are also strong indications that molasses may be omitted from the formula without lessening its efficiency.

Next to grasshoppers, cutworms are the worst pest in Montana. *Porosagrotis orthogonia* [*R.A.E.*, A, ix, 21] has appeared, and threatens to be more destructive than any species yet encountered. It caused at least £200,000 damage in the year.

In potato spraying experiments it was found that both zinc arsenite and calcium arsenate are quite as efficient as Paris green, and are one-third cheaper. Limited experiments with crude white arsenic as a dust secured promising results.

TREHERNE (R. C.) & RUHMAN (M. H.). **The Onion Maggot.**—*Proc. Entom. Soc. Brit. Columbia, Victoria, B.C.,* Econ. Ser. no. 11, April 1920, pp. 91–94.

RUHMAN (M. H.). **Observations on the Control of the Onion Maggot** (*Hylemyia antiqua*)—*ibidem*, pp. 94–97. [Received 19th November 1920.]

Owing to the success of the use of poison-baits as a means of controlling the onion maggot (*Hylemyia antiqua*) in Eastern Canada and elsewhere, this method has been tried under varying conditions in British Columbia, but in 1919, in spite of favourable circumstances, it did not prove effective [*R.A.E.*, A. viii, 323].

BAIRD (A. B.). **Some Notes on the Tent-Caterpillar.**—*Proc. Entom. Soc. Brit. Columbia, Victoria, B.C.*, Econ. Ser. no. 11, April 1920, pp. 97–102. [Received 19th November 1920.]

A very severe outbreak of tent-caterpillars, *Malacosoma pluvialis* and *M. disstria* var. *erosa*, occurred in British Columbia during 1919. This was probably partly due to the cold weather, which reduced the work of parasites and delayed the appearance of the caterpillars until after the foliage was all out. The life-history is briefly described. The remedial measures advocated include destruction of clusters of eggs and caterpillars, spraying and banding [*R.A.E.*, A, i, 231]. During 1919 the parasites, *Campoplex* (*Ameloctonus*) *validus* and *Rhogas* sp., were present in small numbers. In Victoria the natural enemies successfully reduced the outbreak, but control is far from complete, and the necessity for a co-ordinated campaign against these moths is emphasised.

RUHMAN (M. H.). **Observations on the Use of Poison Baits for the Control of Cutworms in 1918.**—*Proc. Entom. Soc. Brit. Columbia, Victoria, B.C.*, Econ. Ser. no. 11, April 1920, pp. 102–104. [Received 19th November 1920.]

Poison-baits are a most effective means of controlling cutworms, provided they are properly mixed and care is taken to prevent contact with the plant when applying them. The formula advocated consists of 50 lb. of bran and 1 lb. of Paris green mixed in the dry state ; 2 qts. of molasses should be dissolved in 1 gal. of heated water to which are added another 4 gals. of water and the juice and finely chopped pulp and peel of 6 lemons. The Paris green and bran is gradually added to this mixture. The bait should be freshly made, and distributed immediately after the ground has been prepared, but before planting or sowing takes place. In infested areas this bait should be applied every spring to protect the crops. The probable cost is about 2s. 6d. per acre.

TREHERNE (R. C.). **General Records of Work carried on in the United States and Canada in 1918.**—*Proc. Entom. Soc. Brit. Columbia, Victoria, B.C.*, Econ. Ser. no. 11, April 1920, pp. 104–107. [Received 19th November 1920.]

This is a compilation of records of measures against insects most of which have been previously noticed in this *Review*.

A terrivel "Escama Chineza," *Aspidiotus perniciosus*, **já foi encontrada no Brasil?** [Has the San José Scale been found in Brazil?] —*Chacaras e Quintaes, S. Paulo*, xxii, no. 4, 15th October 1920, pp. 290–291, 1 fig.

The presence of the San José scale, *Aspidiotus perniciosus*, is reported from the Brazilian State of S. Paulo, and the necessity for immediate measures against it is emphasised.

Os Insectos damninhos, viii. A Lagarta da Couve, *Pieris monuste*, **L.** [Injurious Insects, viii. The Cabbage Caterpillar, *P. monuste*.] —*Chacaras e Quintaes, S. Paulo*, xxii, no. 4, 15th October 1920, pp. 296–298, 1 fig.

The Pierine pests of cabbage are represented in Brazil by *Pieris monuste*. The measure advised is the collection of the eggs and caterpillars. The Braconid, *Apanteles* (*Microgaster*) *glomeratus*, is a useful parasite, and some notes on it are given in order to enable growers to recognise it.

Habermehl (—). **Beiträge zur Kenntnis der palaearktischen Ichneumonidenfauna.** [Contributions to the Knowledge of the palaearctic Ichneumonid Fauna.]—*Zeitschr. wiss. Insektenbiol., Berlin*, xv, no. 10–12, 1 August 1920, pp. 246–248.

This is the final instalment of a paper spread over a period of four years. In the case of all the species enumerated locality records are given. In many instances notes on synonymy and systematic descriptions are appended.

Stellwaag (F.). **Pilzkrankheiten bei Insekten. Sammelbericht über die neuere Literatur.** [Fungus Diseases of Insects. A Summary of the more recent Literature.]—*Zeitschr. wiss. Insektenbiol., Berlin*, xiii, nos. 5–6, 7–8, 9–10; 30th June, 31st August, 31st October, 1917; pp. 142–144, 211–216, 252–253.

The title indicates the subject-matter of this paper, in which 45 references are briefly summarised.

Schneider-Orelli (O.). **Zur Biologie und Bekämpfung des Frostspanners,** *Operophthera brumata*, **L.** [The Bionomics and Control of *Cheimatobia* (*O.*) *brumata*.]—*Zeitschr. wiss. Insektenbiol., Berlin*, xiii, no. 7–8, 31st August 1917, pp. 192–197.

Criticism is levelled against the statements contained in two papers on *Cheimatobia brumata* by Uffeln, one of which has been previously noticed [*R.A.E.*, A, vi, 7]. As regards practical points, the application of banding as low down the trunk as possible has no disadvantageous results, though on the other hand it entails no particular advantages. It is, however, a fact that application at breast-height is easier than lower down, and furthermore that placing of bands near the ground is not possible in the case of many old fruit-trees owing to the irregular shape of the trunk. The further suggestion that the adhesive be applied direct to the bark of fruit-trees is objected to for general use, as young trees in particular would be injured by this measure.

Kleine (R.). **Biologische Beobachtungen an** *Sitodrepa panicea*, **L.** [Biological Observations on *S. panicea*.]—*Zeitschr. wiss. Insektenbiol., Berlin*, xiii, no. 11–12, 31st January 1918, pp. 271–278.

The observations here recorded were made as a result of the infestation by *Sitodrepa panicea*, L., of a loaf that had been overlooked for so long that it had become quite hard.

Oviposition is a gradual process; the female eats her way for a short distance, lays an egg in a small niche, feeds a little farther and

deposits another egg, and so on. Food therefore appears to be necessary to oviposition. The excavated material is used for food, as no trace of débris was seen. The eggs are thus distributed along the mother-gallery and hatch successively. The larva feeds at the place where it hatches, so that the pupa is found in a hollow chamber. The larva does not wander, and all the mines are made by the adults. It is only exceptionally that the young adult bores an exit from the pupal chamber; as a rule it emerges through the mother-gallery. Nothing definite can be said regarding the sequence of generations. Young adults appeared continuously from November 1916 to May 1917, and when the loaf was divided, all stages were found except eggs. This uninterrupted sequence was due not only to the presence of food, but to the warm indoor temperature.

Although *S. panicea* does not leave its feeding place except for mating, it is attacked by a number of parasites, of which a Pteromalid, *Lariophagus puncticollis*, Möll., which emerges from the pupa, is the most common. At the time of chief development the proportion between host and parasite was as 1 to 1; later on it was as 3 to 2. At the time of writing the parasites were twice as numerous as the hosts. Some pupae had been killed by a bacterial disease; the original infection was probably communicated to the larvae or pupae by the adults.

As regards food, a bread containing wheat flour was preferred, but black bread was eaten in its absence. Unbaked flour or bread were not touched. This also applies to wheat itself. Cork was rejected. Young adults lacking a suitable food did not feed or breed.

KLEINE (R.). **Beschädigung der Hülsenfrüchte in Pommern durch** *Grapholitha dorsana*, **F., in den Jahren 1915–1917.** [Injury to Peas and Beans in Pomerania by *Cydia dorsana* in 1915–1917.]—*Zeitschr. wiss. Insektenbiol., Berlin*, xiv, nos. 3–4 & 5–6, 30th June & 20th September 1918, pp. 80–85 & 123–129.

The conclusions reached in this paper are that the extent of the infestation of leguminous crops by *Cydia dorsana* depends largely on accidental circumstances and on agricultural measures. No given species of bean appears to be either particularly susceptible or immune to attack; infestation varies, not only in different years, but also in different districts. The author believes that the character of the soil exercises a very considerable influence, but nothing definite has been ascertained as regards this. At present only general measures of a preventive nature can be advised, as it is impossible to know whether infestation will be favoured or checked by the weather.

ADLER (—). **Zur Biologie von** *Apanteles glomeratus*, **L.** [Notes on the Biology of *A. glomeratus*.]—*Zeitschr. wiss. Insektenbiol., Berlin*, xiv, no. 7–8, 15th December 1918, pp. 182–186, 3 figs.

Many attempts have been made to ascertain the method of oviposition of *Apanteles glomeratus*, L., in *Pieris brassicae*. Matheson in America published in 1907 an account of his experiments according to which individuals of *A. glomeratus* caged with caterpillars of *Pieris rapae* sought somewhat small-sized specimens of the latter and repeatedly deposited eggs in them at the rate of 15–35 eggs each time, a caterpillar in which oviposition had thrice occurred containing 65 eggs when examined. This paper came to the author's notice after

completion of the experiments described below, the results of which differ from those of Matheson. He later used caterpillars of *P. rapae* in attempts to reproduce Matheson's results, but without success.

In his own experiments the author was unable to get *A. glomeratus* to attack ordinary caterpillars of *P. brassicae*. Nor was he apparently successful in inducing them to parasitise the eggs, but when an attempt was made to rear the caterpillars hatched from them, it was found that of 34 caterpillars no less than 31 proved to be parasitised. Further experiment showed that the explanation of this is that *A. glomeratus* oviposits, not in the eggs of the host, but in quite newly-hatched caterpillars. On an average 20 seconds are sufficient for the deposition of a batch of eggs, the number of eggs per caterpillar varying from 6 to 32. As up to 180 parasitic larvae have been found in one caterpillar, the attacks must be repeated.

In a similar experiment made with the eggs of *Abraxas grossulariata* similar results were obtained.

STICHEL (H.). **Einiges über** *Zeuzera pyrina*, **L.** [Some Notes on *Z. pyrina*.]—*Zeitschr. wiss. Insektenbiol., Berlin,* xiv, no. 7–8, 15th December 1918, pp. 198–200.

The Cossid moth, *Zeuzera pyrina*, L., has often been stated to be especially a pest of horse-chestnut, but this has no foundation in fact. A number of references are given to records of other food-plants. The author himself has observed it on birch and elm.

SCHUMACHER (F.). **Einige schädliche Hemipteren von der Insel Java.** [Some injurious Rhynchota from Java.]—*Zeitschr. wiss. Insektenbiol., Berlin,* xiv, no. 9–10, 25th March 1919, pp. 221–224.

In 1900 Dr. A. Zimmermann published in the *Annales du Jardin Botanique de Buitenzorg* a paper on leaf spots due to Rhynchota and other pests in Java, only a few of which were named. The author has now been able to study Zimmermann's original material, and gives a list with notes on the literature, synonymy, and food-plants.

The Pentatomid bug, *Antestia partita*, Wlk. (*plebeia*, Voll.), is an important coffee pest ; Zimmermann found it also on *Fraxinus edenii*, *Morinda citrifolia*, and *M. bracteata*. *Malcus flavidipes*, Stål, was found on *Thunbergia alata*, and *Dulinius conchatus*, Dist., on *Morinda citrifolia*. *Mertilia malayensis*, Dist., was reported as an orchid pest by Zimmermann [*R.A.E.*, A, vii, 39] ; this Capsid bug has been imported into Germany with orchids from the East Indies. A species allied to *Mertilia* is *Bromeliaemiris bicolor*, gen. et sp. n., briefly described here ; Zimmermann found it on various Bromeliaceae. The Jassid, *Typhlocyba erythrinae*, Konings., is a well-known pest of *Erythrina* (dadap), used as a shade for coffee. Another species of *Typhlocyba* was recorded by Zimmermann from *Aralia guilfoylei*.

SCHUMACHER (F.). **Ein Kleinschmetterling als Einmieter in Pistaziengallen.** [A Microlepidopteron as a Tenant of Pistachio Galls.]—*Zeitschr. wiss. Insektenbiol., Berlin,* xiv, no. 9–10, 25th March 1919, p. 240.

In galls of *Pistacia terebinthus*, caused by *Pemphigus derbesi*, Licht., and *P. pistaciae*, L. (*cornicularis*, Pass.), obtained from Macedonia, the author found the caterpillar of a Microlepidopteron believed to be *Stathmopoda guerini*, Stn.

SCHUMACHER (F.). *Leucopis nigricornis*, **Eggers, eine in Schild und Blattläusen parasitierende Fliege.** [*L. nigricornis*, a Dipterous Parasite of Coccids and Aphids.]—*Zeitschr. wiss. Insektenbiol., Berlin*, xiv, no. 11–12, 15th July 1919, pp. 304–306.

The Agromyzid fly, *Leucopis nigricornis*, Egg., has been recorded from the following hosts, chiefly in North America.

Coccids: *Eriopeltis lichtensteini*, Sign., *E. festucae*, Boy., *E. coloradensis*, Ckll., *Pulvinaria innumerabilis*, Rathv., *P. acericola*, Walsh & Riley, *P. floccifera*, Westw., *P. betulae*, L., *Eriococcus spurius*, Mod., *Lepidosaphes ulmi*, L., *Chionaspis americana*, Johns., *C. pinifoliae*, Fitch, and *C. ortholobis*, Comst. Aphids: *Aphis cephalanti*, Thom., *A. gossypii*, Glov., *Aphis* spp. on thistles, willow, and cherry, *Pemphigus bursarius*, L., *P. transversus*, *Siphonaphis padi*, L. (*Macrosiphum avenae*, F.), and *Macrosiphoniella* (*Macrosiphum*) *sanborni*, Gill.

HERBERG (M.). **Die Schildlaus,** *Eriopeltis lichtensteini*, **Sign.** [The Coccid, *E. lichtensteini*.]—Separate from *Arch. f. Naturg.*, 1916, Abt. A, no. 10, 107 pp., 80 illustrations. (Review in *Zeitschr. wiss. Insektenbiol., Berlin*, xiv, no. 11–12, 15th July 1919, pp. 314–315.)

This monograph is said to be an almost exhaustive study of the morphology, biology and anatomy of the scale, *Eriopeltis lichtensteini*, Sign. Particular attention is given to its parasites, of which an Agromyzid, *Leucopis nigricornis*, a Chalcid, and a fungus, *Cladosporium coccidarum*, have been observed. Experiments with Coccinellid enemies proved unsuccessful. The eggs withstand the temperatures of a North German winter, and resist exposure for 2 hours to 49° C. (120° F.), though 44° C. (111° F.) is fatal to the larvae.

WILLER (A.). **Beobachtungen zur Biologie von** *Melasoma populi*, **L.** [Observations on the Biology of *M. populi*.]—*Zeitschr. wiss. Insektenbiol., Berlin*, xv, nos. 1–3, 4–6, 27th September & 15th December 1919, pp. 44–47, 65–73, 9 figs.

Tables are given showing the difference in the measurements of the sexes in *Melasoma populi* and *M. tremulae*.

M. populi occurs almost exclusively on young specimens of *Populus alba*. The injury done to the leaves by the adults and larvae is described. The males predominate slightly. The eggs are usually laid on the underside of the leaves in batches of 40–60. When newly-hatched, the larvae remain feeding together. Under laboratory conditions a considerable mortality occurs among the larvae after the third moult.

KLEINE (R.). **Begünstigung der Entwicklung schädlicher Insekten durch Chenopodiaceen und ihre Bekämpfung in der Landwirtschaft.** [The Favouring of the Development of Injurious Insects by Chenopodiaceae and Methods for combating them in Agriculture.] —*Zeitschr. wiss. Insektenbiol., Berlin*, xv, no. 7–9, 30th April 1920, pp. 142–146.

Owing to war-conditions agricultural land in Germany has been overrun with weeds. Among those that are not only harmful in

themselves, but also assist the development of insect pests, are the Chenopodiaceae, especially *Chenopodium album*, which grows abundantly in potato-fields. Among the pests favoured by it is *Pegomyia hyoscyami*, Panz. Up to recent years this fly was not abundant enough to infest *Chenopodium*, its chief food-plant, seriously, but lately it has increased to such an extent as to threaten beet cultivation in some parts of Germany. The chief injury is done to young, four-leaved beet. Should the plants recover from the first attack, they have to undergo a second and again a third. This last is due to the third generation of the fly, which appears so late that the injury in the beet fields is seen in September and October. The eradication of the weed is an obvious remedial measure. If infestation appears on the beet, it becomes a matter of dealing with the first generation of *P. hyoscyami* by gathering the infested plants, which must be immediately removed from the field and either used as fodder or buried. The plants must not be placed in compost heaps or left uncovered in contact with the ground, as beet withers slowly, and many larvae are thus enabled to pupate in the ground. A simple method of collecting the adults is provided by the raking machine found on farms. The actual rake being lifted out of gear, sacks covered with an adhesive are suspended from the beam bridging the space between the two wheels, and the machine is drawn through the field by a horse. the progress of which disturbs the flies. Even if only a portion of the latter are caught, any decrease in their numbers prior to oviposition will have an effect on infestation. A machine 6 feet wide can easily cover over 18 acres a day.

Beet cultivation is also seriously affected by the larvae of *Blitophaga opaca*, L., and *B. undata*, Müll. The author is inclined to believe that these beetles prefer beet to *Chenopodium*. Infestation occurs at the same time as the first attack by *P. hyoscyami*, and is local in character. In infestations of these beetles the field must be left undisturbed until the young autumn shoots no longer show signs of injury. This indicates that the larvae have migrated to the ground in order to pupate. At this time the plants must be gathered, the most vigorous being left standing. If the plants are attacked by both *Pegomyia* and *Blitophaga*, which is seldom the case, it is best to wait as if only *Blitophaga* were concerned.

In connection with beet pests it is mentioned that *Phosphuga atrata*, L., cannot be reckoned among them, as has been generally believed.

Other pests harboured by *Chenopodium* are *Cassida nebulosa*, L., and *Aphis rumicis*, L. The last-named is the most troublesome as no effective measures are applicable against it.

KRAUSSE (A.). **Häufigkeit und Schädlichkeit des Eichenspinners,** *Lasiocampa quercus*, **L.** [The Frequency and Injuriousness of *L. quercus*.]—*Zeitschr. wiss. Insektenbiol., Berlin*, xv, no. 7–9, 30th April 1920, pp. 190–191.

In forestry literature *Lasiocampa quercus*, L., is often mentioned as a pest, but from his own experience and that of others the author considers that the damage done by this moth is slight in character, and though widely distributed in Germany, it is so rare as to be quite unimportant economically.

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THE REVIEW OF APPLIED ENTOMOLOGY

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Kleine (R.). **Einfluss der Wetterlage auf das Auftreten von** *Grapholitha dorsana,* **F.** [The Influence of Weather on the Occurrence of *Cydia dorsana.*]—*Zeitschr. wiss. Insektenbiol., Berlin,* xv, no. 10–12, 1st August 1920, pp. 259–260.

In the course of observations on *Cydia dorsana* in Pomerania [*R.A.E.,* A, ix, 37], it was found that infestation is influenced by rain or atmospheric humidity. Mature peas that are able to harden quickly escape injury, but heavy rain may cause hardened peas to swell and softens them sufficiently to permit injury by the young caterpillars. A humid atmosphere prevents hardening, with the same result. Once the caterpillars are half-grown the hardened condition of the peas is no deterrent to attack. Weather is therefore an important factor in districts where pea growing is menaced by *C. dorsana,* and such crops are risky in infested districts where the heaviest rain occurs in July. Coastal districts are likewise unsuitable on account of the damp atmosphere.

Kurisaki (M.). **A new Species and the Variations of the Wing Veins of Aphididae in Japan.**—*Insect World, Gifu, Japan,* xxiv, no. 9, 15th September 1920, pp. 297–301, 1 plate.

Trichosiphum kashicola, sp. n., attacks the tender leaves of *Quercus acuta* and *Q. myrinaefolia* in Japan. The adult and nymph of the winged viviparous female are here described, an English translation being given. A note is also given on the importance in classification of variations in the wing veins of Aphids.

Kurisaki (M.). **On the Hosts of Aphididae in Japan.**—*Insect World, Gifu, Japan,* xxiv, no. 10, 15th October 1920, pp. 340–341.

The food-plants are given in Japanese of *Brevicoryne* (*Aphis*) *brassicae, Myzus* (*Rhopalosiphum*) *persicae,* and two species of *Lachnus.*

Le Pyrèthre de Dalmatie.—*Rev. Agric. Afr. Nord, Algiers,* no. 63, 15th October 1920, pp. 306–307, 1 fig.

An account is given of the methods of cultivation of *Pyrethrum cinerariaefolium.* The pyrethrum powder made from it is of great importance in the destruction of *Clysia ambiguella,* and in Dalmatia its production is regarded from the commercial standpoint as second only to that of the vine itself.

The flowers lose about $\frac{2}{3}$ or $\frac{3}{4}$ of their weight in drying, and $4\frac{1}{2}$ lb. of dry flowers make about 28 lb. of concentrated pyrethrum solution—enough to treat nearly 1,100 yards of vines.

Malpeaux (N.). **La Conservation des Grains. Les Ennemis des Grains emmagasinés.** [The Preservation of stored Grain.]—*La Vie Agric. et Rur., Paris,* xvii, no. 47, 20th November 1920, pp. 315–317, 3 figs.

A popular account is given of the more important pests of stored grain and the means of combating them.

Schribaux (E.). **Désinfection des Graines de Coton par la Chaleur sèche.** [The Disinfection of Cotton Seed by dry Heat.]—*L'Agron. Colon., Paris,* vi, no. 34, October 1920, pp. 103–104.

As wheat and beet seed resist high temperatures for a long time, experiments were made with cotton seed at the Seed Experiment

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Station of the French Ministry of Agriculture. Up to a temperature of 70° C. [159° F.] 3 hours treatment does not impair the vitality of the seed. At 75° C. [168° F.] 2 hours exposure either kills the seed or makes the plants weakly. A temperature of 60° C. [140° F.] seems ample for the purpose of destroying all animal pests, and can safely be used.

As only a small quantity of seed is required for planting, the author suggests that disinfection can be effected by mixing the seed with sand or sawdust that has been heated to 60° C. in a big pan. A few preliminary tests will show what quantity of sand or sawdust is needed for the purpose of maintaining the mass at 60° C. [140° F.] for at least 1–2 hours.

CIMATTI (V.). **I Nemici del Frumento.** [Wheat Pests.]—*Riv. Agric., Parma*, xxvi, nos. 39, 43, 45, 46, 47 ; 23rd September, 22nd October, 5th, 12th, 19th November 1920 ; pp. 484-486, 536–537, 557–559, 571, 586–587 ; 9 figs.

In view of the urgent need for increased agricultural production in Italy, losses due to animal pests, especially insects, are doubly severe. These popular articles are intended to make known the insect pests of wheat ; they contain no new information.

FROGGATT (W. W.). **Insects found on Tobacco in New South Wales.**—*Agric. Gaz. N.S.W., Sydney*, xxi, pt. 10, October 1920, pp. 714–716, 3 plates.

The insects here described were observed on tobacco during an investigation of damage caused by thrips. *Phthorimaea operculella*, which is normally a potato pest, also attacks tomato and tobacco. It is consequently not advisable to grow and keep bagged potatoes in the vicinity of tobacco fields, and all rejected and waste tobacco plants, potato stalks and tomato vines should be regularly cleaned up and burnt. The moths emerging from the drying tobacco stalks would then have little suitable food upon which to oviposit.

Nysius vinitor (Rutherglen bug) might become dangerous to tobacco under favourable climatic conditions. Any waste land or rubbish near the fields should be burnt over as soon as the insect is observed. The green leaf Jassid was numerous, as were two small green plant-bugs, *Dicyphus tabaci*, sp. n., and another unidentified species of the same genus.

LEWIS (A. C.) & MCLENDON (C. A.). **Cotton Variety Tests 1919.**—*Georgia State Bd. Entom., Atlanta*, Circ. 29, January 1920, 9 pp. [Received 25th November 1920.]

The results of a series of cotton variety tests are here summarised, and from them are drawn recommendations as to the varieties of cotton that can be most successfully grown under present boll weevil and disease conditions in Georgia.

The ideal cotton plant to grow when the cotton boll weevil [*Anthonomus grandis*] is present should begin fruiting close to the ground early in the season, and have long fruiting branches at the base that continue to grow throughout the season. The fruiting spurs of the cluster and the short fruiting branches of the semi-cluster types of cotton do not continue to grow throughout the season. Under boll weevil conditions the more cotton that is produced on the lower half of the plant, the larger will be the yield per acre.

A. grandis is now present in the greater part of Georgia, and it is important to grow a variety of cotton adapted to the soil and climate, and to keep to the best improved seed of that variety. If an individual does not improve his own cotton seed by careful selection, it will pay him to buy improved seed from someone who does.

MACKINNON (E.). **Beneficial** *versus* **Injurious Insects.**—*Science and Industry, Melbourne*, ii, nos. 8 and 9, August and September 1920, pp. 473–483 and 549–559.

The different groups of parasitic and predaceous entomophagous insects are described, and an account given of their employment in various parts of the world, and particularly in America, as a means of controlling injurious insects.

MILLER (D.). **Leaf-stem Gall-aphis of the Poplar.**—*N.Z. Jl. Agric., Wellington*, xxi, no. 3, 20th September 1920, pp. 134–135, 2 figs.

Pemphigus populitransversus, Riley (poplar gall aphis), is here recorded from Central Otago, forming galls on the leaf-stems of poplar trees. This insect is of some interest to agriculturists, as the winged females that appear in the autumn migrate to the leaves of cruciferous plants, such as rape, cabbage, mustard and turnip, and several allied weeds. Their apterous progeny move down and establish a colony on the roots, a fact that might cause considerable loss if the infestation were severe, though normally little damage is done.

Winged females from the root colonies in the spring return to poplars, where they give rise to the sexual forms, both of which are wingless. Eggs are laid in the bark, and the resulting Aphids form galls on the leaf-stems, in which parthenogenetic reproduction is continued through the summer.

FISHER (W. S.). U.S. Bur. Entom. **A New Genus and several New Species of Cerambycidae. (Col.)**—*Proc. Ent. Soc. Washington, D.C.*, xxii, no. 7, October 1920, pp. 153–159.

The following new Cerambycids are described :—*Anoplocurius canotiae*, gen. et sp. n., from dead branches of *Canotia holacantha* in Arizona ; *Callidium pseudotsugae* from wood of Douglas fir (*Pseudotsuga taxifolia*) in California and Oregon ; *C. sequarium* taken under bark on fallen branches of *Sequoia washingtoniana* in California ; and *C. juniperi* from under bark of *Juniperus* sp. in New Mexico.

BURKE (H. E.). U.S. Bur. Entom. **Some Notes on the Genus** *Trachykele* **with a Description of a New Species (Buprestidae, Coleoptera).**—*Proc. Ent. Soc. Washington, D.C*, xxii, no. 7, October 1920, pp. 168–170.

Trachykele hartmani, sp. n., is here described from adults and larvae taken in Sargent cypress (*Cupressus sargenti*) in California.

PRATT (O. A.). **Mexican Army recognises Plant Quarantine.**—*Mthly. Bull. California Dept. Agric., Sacramento*, ix, no. 9, September 1920, pp. 363–364. [Received 30th November 1920.]

In view of a movement of troops from Mexico City to the Northern District of Lower California, considerable uneasiness was felt on the part of the cotton interests lest this might be the means of introducing the pink boll worm [*Platyedra gossypiella*] or the Mexican cotton boll weevil [*Anthonomus grandis*] into the cotton fields of Imperial Valley, as it was known that the troops were coming from areas in Mexico

infested with either one or the other or both of these cotton pests. Such troops are usually accompanied by their wives and children, and carry with them all sorts of luggage, including pillows and mattresses that are frequently stuffed with seed cotton, picked by the wayside.

As a result of representations to the officer commanding these troops, and in view of the fact that a fresh issue of kit was to be made to them, it was arranged for the whole outfit that they had with them to be discarded and burnt.

MASKEW (F.). **Quarantine Division. Reports for the Months of July and August 1920.**—*Mthly. Bull. California Dept. Agric., Sacramento,* ix, no. 9, September 1920, pp. 388–392. [Received 30th November 1920.]

The following insect pests were intercepted during the months of July and August :—From Australia, *Pseudococcus citri* on vegetable pear. From Arizona, *Ischnaspis longirostris, Chrysomphalus aonidum* and *Parlatoria* sp. on sour limes. From Central America, *Chrysomphalus dictyospermi* on coconuts ; and *Pseudococcus* sp., *Aspidiotus* sp., *A. cyanophylli, A. cydoniae, Icerya purchasi, Chrysomphalus scutiformis* and *Ceramidia scintellocollaris* on bananas. From China, *Cylas formicarius, Cathartus advena* and an undetermined weevil in sweet potatoes ; *Araecerus fasciculatus, Cathartus* sp., *Silvanus* sp. and undetermined Coleoptera in yams ; *Rhizopertha dominica, Calandra oryzae, Cathartus* sp. and *Laemophlaeus* sp. in paddy rice ; *Lasioderma serricorne* in licorice root ; weevils and other Coleoptera in roots ; and Lepidopterous larvae on leaves and in dry fruit and birdseed. From Colorado, green Aphids on cyclamen plants. From Cuba, *Calandra oryzae* and *Tribolium* sp. in rice. From Florida, *Lepidosaphes beckii* on oranges. From Hawaii, *Diaspis bromeliae* and *Pseudococcus bromeliae* on pineapples ; *Hemichionaspis minor, Pseudococcus* sp., *Prenolepis* sp., *Chrysomphalus aurantii, C. aonidum,* and *Ripersia palmarum* on coconuts ; *Diaspis bromeliae, Pseudococcus* sp., *P. bromeliae,* caterpillars, beetles, spiders and ants on bananas ; *Dacus* (*Bactrocera*) *cucurbitae* in string beans and cucumbers ; *Ceratitis capitata* in mangos ; and *Coccus longulus* and *C. elongatus* on betel leaves and plants. From Japan, *Calandra oryzae* and unidentified Coleopterous larvae in seed rice, and Lepidopterous larvae on walnut sacks. From Mexico, *Saissetia oleae* and *Lepidosaphes beckii* on oranges ; *L. beckii* on lemons ; and *L. beckii, L. gloveri, Ischnaspis longirostris, Aspidiotus* sp. and *Parlatoria pergandei* on limes. From New Jersey, *Aleurodes* sp. on strawberry plants. From Ohio, *Aphis* sp. on ferns. From Oregon, *Cydia* (*Laspeyresia*) *pomonella* in pears. From Papeete, *Hemichionaspis minor* on squash. From Pennsylvania, *Lepidosaphes beckii* on Florida grape-fruit. From Peru, *Tribolium ferrugineum, Laemophlaeus* sp. and an undetermined Ptinid in cotton seed. From Salvador, *Chrysomphalus aurantii* and *L. beckii* on oranges. From Tahiti, *L. beckii* on lemons, a Coccid on limes, and caterpillars in dry herbs. From the British West Indies, undetermined Lepidopterous larvae in cassia bean pods.

FULLAWAY (D. T.). **New Species of *Sierola* with explanatory Notes.**—*Occasional Papers Bernice Pauahi Bishop Mus. Polynes. Ethn. & Nat. Hist., Honolulu,* vii, no. 7, 1920, pp. 57–159, 1 plate.

Of the Dryinids here described 171 new species of *Sierola* are from Hawaii, one from Fiji and one from China. Among the Hawaiian

species, *S. timberlakei* was bred from larvae of *Batrachedra sophroniella*, *S. pulchra* from leaf-miners in *Urera*, *S. capuana* from larvae of *Capua cassia* and *Tortrix* (*Archips*) *longiplicatus*, *S. gracilariae* from larvae of *Gracilaria mabaella*, *S. cryptophlebiae* from larvae of *Cryptophlebia illepida*, and *S. batrachedrae* from larvae of a species of *Batrachedra* infesting a fern (*Acrostichum*).

KEILIN (D.) & PICADO (C.). **Biologie et Morphologie Larvaires d'*Anastrepha striata*, Schiner, Mouche des Fruits de l'Amérique centrale.**—*Bull. Sci. de la France et de la Belgique, Paris*, xlviii, no. 4, 25th October 1920, pp. 423–441, 6 figs.

Anastrepha striata, Schin., causes great damage to guava trees (*Psidium* spp.) in Costa Rica. Although orange trees, coffee, avocado and mangos are grown in the vicinity, their fruits are apparently not attacked by this fruit-fly. Oviposition occurs probably throughout the year, but always in guava fruits. Certain species of *Psidium* are more or less immune from attack, but the cause of immunity has not been ascertained. The morphology of the larva is described.

The remedial measures advocated include the harvesting of fruit before maturity and before the larvae have penetrated into them, removal and burning of windfalls, digging up the ground round the trees, thus exposing the pupae to be eaten by fowls, and the introduction of natural enemies. The Braconid parasite, *Diachasma crawfordi*, that attacks this pest may be easily bred.

A spray that has proved successful against *A. ludens*, Lw., may also prove to be as valuable against this species. It is composed of 19 gals. of crude carbolic acid, 185 lb. of whale oil soap and 152 gals. of water. This carbolic emulsion should be diluted with water in the proportion of 1 to 20 before application.

Additions to the Wild Fauna and Flora of the Royal Botanic Gardens, Kew: xv.—*Bull. Misc. Inform. R. Bot. Gdns., Kew, London*, no. 6, 1920, pp. 212–217.

The greater portion of this paper dealing with insect pests occurring at the Royal Botanic Gardens, Kew, has been compiled by Mr. F. Laing. The list comprises 85 species, including many Aphids, Aleurodids, Psyllids and Coccids.

According to Mr. H. A. Baylis the Nematode, *Mermis nigrescens*, which is an insect parasite, was extremely abundant during June 1920.

BOODLE (L. A.) & DALLIMORE (W.). **Bamboos and Boring Beetles.**—*Bull. Misc. Inform. R. Bot. Gdns., Kew, London*, no. 8, 1920, pp. 282–285.

Bamboos used in India for building purposes are very liable to attack by boring beetles, but if soaked in water before use, they generally remain untouched. As a result of experiments on *Dinoderus minutus*, F., undertaken at the Royal Botanic Gardens, Kew, to ascertain the reason for this, it seems probable that soaking in water results in the removal of most of the sugar-content, and this renders the bamboos unattractive to the beetles.

LEEFMANS (S.). **De Klappertor** (*Oryctes rhinoceros*, **L.**) [The Coconut Beetle, *O. rhinoceros*.]—*Meded. Inst. Plantenziekten, Buitenzorg*, no. 41, 1920, 156 pp., 19 plates. [With an English Summary.]

The two most important pests of coconut are the coconut beetle, *Oryctes rhinoceros*, and the coconut weevil [*Rhynchophorus ferrugineus*],

owing to the fact that the damage they do is continuous and not seasonal. In the Dutch East Indies the coconut palm is a very important economic factor in the life of the natives, but in spite of this very little original work has been done there as regards its enemies.

The work here described was begun at Buitenzorg (Java) and continued at Padang, on the West Coast of Sumatra, where *O. rhinoceros* (usually associated with *Rhynchophorus*) does considerable damage. Counts in various localities showed that 60 to 80 per cent. of all the coconut palms were injured, and over 10 per cent. were dead. The annual loss may be estimated at several million florins in the Dutch East Indies.

Particulars are given of the recorded world distribution of *O. rhinoceros*. It is found throughout the Dutch East Indies, but does not often occur at altitudes above 2,300 ft. Two other species, *O. trituberculatus*, Lansb., and *O. centaurus*, Sternb., are more locally distributed. A short description of *O. rhinoceros* and *O. trituberculatus* is given.

Previous investigations are briefly reviewed. The life-history of *O. rhinoceros* was still imperfectly known, especially as regards the duration of the larval stage, and consequently of the whole developmental period, which latter has been variously estimated between 5 months (Friederichs) and 2 years (Banks). The whole subject was therefore worked out independently.

In the low-lying coastal districts the egg-stage averages 12 days. In trap-heaps the eggs are usually found in the lower parts. Owing to their white colour they are easily seen.

The newly hatched larva is entirely white, but later on its head becomes brown. The young larva is grey blue. In older or mature larvae this colour turns to white or yellowish white. As there is a risk of confusing the larvae of *O. rhinoceros* with others that occur in the same breeding places, a table is given showing the nature of the breeding places and the differences distinguishing the larvae. The length of the larval stage varied roughly from 2 to 4 months, a result that differs materially from published ones ; the latter may be due to poor feeding or other abnormal conditions.

It has been stated that the larvae can live in marshy ground, but there was no corroboration of this during these investigations. The larvae occur only in soils composed of substances on which they are able to feed, and they do not gnaw the roots of living plants. The larvae found attacking roots are those of *Xylotrupes* and other species. The larvae of *Oryctes* do, however, use their powerful jaws for gnawing wood that is not rotten.

The following list of breeding places, in order of decreasing importance, was compiled :—Communal refuse heaps of villages and towns, nipa-palm rubbish, dying and dead (erect or fallen) trunks of coconut and other palms (*Oncosperma horrida, Corypha gebanga, Metroxylon sagus, Elaeis guineënsis*), vegetable rubbish (coffee and cacao husks, leaves and fruit peel, etc.), decayed dung of cattle, buffalos and horses, rubbish from sugar-cane and rice-husking mills. The author has not found *O. rhinoceros* in the rotten stems of trees other than palms, as stated by Friederichs, but Corporaal has done so, though this appears to be exceptional. Examination showed that vegetable rubbish that is one month old is suitable for oviposition and larval development. In small quantities of refuse, *e.g.* about a cubic yard, the attraction for the beetles reaches its maximum after 3 months and then rapidly decreases. In 8–9 months the refuse has turned to

humus and is no longer attractive. Young coconut stems rot, and are infested, more quickly than old ones.

In order to pupate, the larvae burrow about 12 inches into the ground. When examining trap-heaps, especially if they are more than 2 months old, the ground beneath them must also be examined. Pupae were very seldom found in rotten stems, but in a few standing ones newly-emerged adults have been noticed, showing that the larvae had been unable to reach the ground. The inactive larval stage that occurs prior to pupation averages about 11 days.

The pupa is described. In the laboratory the average length of the pupal stage was about 23 days.

Many details about the adults are given. They emerge after an inactive period of about 20 to 24 days. The males predominated both in the crowns of dead or injured coconut palms and in trap-heaps, where they represented 60·6 per cent. of the total. There is no doubt that the beetles feed in the crowns of the palms, but mate in the future breeding places of the larvae, though mating may also occur in the crowns. The various forms of injury by the beetles are illustrated. The holes made by them only prove fatal in cases where water runs into them or the palm weevil (*Rhynchophorus*) is able to enter. The injury done by the larger *O. trituberculatus* does not differ from that of *O. rhinoceros*. Photographs show the different appearance of palms killed by lightning and by rhinoceros beetles. In the former case the outward leaves hang down, while serious injury by *Oryctes* or *Rhynchophorus* causes the central leaves to fall first. In addition to coconut, other palms that may be infested are:—*Corypha gebanga, Livistona, Latania, Sabal, Metroxylon sagus, Pinanga, Nipa fructicans,* and oil palms. *Agave sisalana* is also attacked. The author agrees with Banks that the beetles do not eat fibre, but feed on the sap only. The principal time of flight is between 6 and 7 p.m., and the beetles usually seek palms near their breeding places. The limit of distance appears to be a few hundred yards from the edges of a coconut plantation; for complete security it may be fixed at about 1 kilometre. In Samoa the adults and larvae are said to have been able to spread to distances up to about 6 miles. In 1919 *Oryctes* was found in the Strait of Sunda on the volcanic island of Krakatoa, on which all life was destroyed by the eruption of 1883. The nearest island is 12 miles away, and Java 24. As much drift-wood floats on the rapid current, it is suggested that this spread is due to larvae or pupae transported in coconut logs. Experiments showed that most of the larvae in a log submerged in water with a salt content of 2·8 per cent. survived after 24 hours. The Sunda current can carry a log across in 18 hours. It is possible that in Samoa the larvae have been distributed in a similar manner.

In captivity the maximum life of the adults is 4–4½ months. Oviposition begins 20–62 days after emergence from the cocoon. As many as 71 eggs have been obtained from a single female; formerly 25 was believed to be the normal number.

On the West Coast of Sumatra all stages of development occur throughout the year. In the eastern part of the Malay Archipelago, where there is a long dry monsoon, some periodicity is probable.

Recorded natural enemies include birds, pigs, a fungus (*Metarrhizium*) and Scoliid wasps. One of the last-named, *Triscolia rubiginosa*, parasitises *Xylotrupes gideon*, L., in the Dutch East Indies, but though it paralyses captive larvae of *Oryctes*, all attempts to rear its larvae on those of *Oryctes* have failed.

The only remedial measures suitable for natives seem to be preventive. Those generally advised are embodied in ordinances containing the following instructions :—The uprooting, burning or burying 3 feet deep of palm stumps ; the destroying of coconut trunks by cutting or burning, keeping under water or burying at least 3 feet deep ; the burning of all vegetable refuse ; the regular searching of dung-heaps and the killing of the grubs, etc., found therein. These instructions are incomplete, as they omit the large refuse heaps of towns and bridges constructed of coconut stems. Furthermore, some of them are not feasible. Too much labour is needed to dig up the coconut stumps, and to bury stumps and trunks 3 feet deep or to burn them is too difficult a task in practice. Incompletely burnt refuse attracts the larvae of *Oryctes*, and it was therefore imperative to find a more efficient method. Whoever originally prescribed the burying at a depth of 3 feet evidently did not know what depth was actually required. In tests to find the actual thickness of the covering of sand or soil needed to prevent the beetles from detecting a breeding place, pits were filled with uninfested vegetable rubbish, and every alternate pit was covered with a top dressing of sand varying between 19 and 4 inches in thickness. In 77 experiments not one beetle, larva or egg of *O. rhinoceros* was ever found in the covered pits, whereas the open pits contained 222 eggs, 5,713 larvae, and 78 beetles. There is therefore no doubt that even a thin layer of sand prevents the beetles from locating an attractive breeding place. These experiments were followed by a practical test at Padang on an area of over ½ acre which was covered with a layer of vegetable refuse over which a layer of sand from 2 to 7 inches thick was spread within a fortnight. After 4½ months not a single beetle or larva was found, not even in places where only a few inches of sand had remained. A layer of 8 inches of sand, or other soil without humus, is therefore sufficient to prevent breeding. Communal refuse (where it cannot be incinerated) may be used to improve marshy land near towns, provided it is covered in this manner.

Direct measures for combating *O. rhinoceros* may be divided into those against the beetles and those against the larvae. For filling the hole after killing or removing the beetle with a piece of wire, the author used with success a mixture of 1 part coarse salt and 2 parts sea sand and then closed the hole with clay. Experiments with light-traps were negative, as also were attempts at trapping by means of husks of young nuts suspended in the trees. The best measure against the larvae is to catch them in trap-heaps as already described. The heaps must be searched at intervals not exceeding 3 months, and it is better to examine them every 6 or 8 weeks. In damp climates the placing of the heaps in cool positions is unnecessary, nor is a roof required. Fumigation with carbon bisulphide is possible, but as about 10 fluid oz. are required per 35 cu. ft., its advantages are rather doubtful. Very successful results were achieved by adding sodium arsenite and Paris green to the traps. It was found that ¼ per cent. of these substances did not affect the attractiveness of the bait for the beetles, and though normal oviposition occurred, no larvae developed. As, however, these poisons remain active even after nine months, the material cannot be used for manure during an even longer period. For this reason experiments were made with saltpetre and ammonium sulphate, but they proved inferior, as also did lead arsenate. In experiments in starving the larvae, full-grown examples remained alive for 16½ days, and full-grown individuals that had been starved for 13 days became quite normal after feeding for a few days.

Inundation as a means of killing the larvae failed experimentally; they survived submersion for 24 hours, and one example revived after 48 hours.

Old traps must be supplemented by fresh ones if the catches decrease, but the old ones must be continued for some time longer. Traps of vegetable refuse measuring about 2 cubic yards gave good results. Market refuse, leaf manure, refuse from the nipa industry, coffee and cacao husks are good baits. The captured grubs must be killed, and this is easily effected in boiling water.

Three experiments were undertaken in clearing gardens of breeding places and keeping traps at the same time in a place surrounded by infested native plantations. One of these has terminated and gave fairly satisfactory results. The number of larvae, etc., caught, decreased in a single year by 74 per cent. and the injury to the trees by $37\frac{1}{2}$ per cent. The results of the other two experiments will be published after they have been carried on for $2\frac{1}{2}$ years.

As regards preventive measures, dead or dying palms must be cut at soil-level and the stumps covered with 8 inches of sand or other soil without humus. The logs must either be buried or split up. Logs used for bridges must be treated with preservatives and protected at the ends with sheet metal, and replaced after 9 months. All vegetable refuse of a dangerous character must be buried and covered with sand; burning is advised only if the refuse can be thoroughly incinerated. Animal manure must be covered with sand or kept in pits with a close-fitting cover.

Other measures include thorough examination of the crown when picking the nuts, the beetles being extracted or killed *in situ* and the holes closed up. Where legal ordinances cannot be carried out and planters must take their own measures, the use of controlled trap-heaps is advised in addition to the preventive methods already mentioned. These heaps can most effectively be poisoned as described above.

Franklin (H. J.). **Seventh Report of the Cranberry Substation from 1917 to 1919.**—*Mass. Agric. Expt. Sta., Amherst,* Bull. 192, October 1919, pp. 105–141. [Received 2nd December 1920.]

As an attempted remedy for an infestation of *Epelis truncataria* var. *faxonii*, Minot (cranberry span-worm), a cranberry bog was flooded in 1917 on 20th June, while the moths of both sexes were numerous. The water was drawn off three days later, and had either destroyed or driven ashore all the moths, very few being seen afterwards; but it apparently did little or no harm to the eggs that had been laid previously, and larvae were numerous on the bog in July. These were treated once while young with 6 lb. lead arsenate paste to 50 U.S. gals. water; this remedy proved effective, and very few were found when the bog was swept with a net a few days later. On one bog where the winter flood had been held until nearly June the pupae survived the long submergence, and the infestation was severe in August.

Grubs that were found occasionally in great numbers in the sandy covering of cranberry bogs were thought to be those of *Amphicoma vulpina*, Hentz. (cranberry root grub), as adult beetles of both sexes of this species were found associated with them. These grubs were injurious in much the same way as the root worm, *Rhabdopterus picipes* [*R.A.E.*, A, vi, 553], cutting through the smaller roots in circular or irregular patches. Bushes so infested frequently remain sickly and give a poor crop for several years, or die suddenly in patches during hot, dry weather. It probably takes two or three years for

bushes that are not killed to recover from the effects of infestation after the insects have disappeared. All stages of the insect seem to live beneath the surface of the sand, the adults being found in July about three inches below the surface. The damage done by these grubs was formerly thought to be due to a species of *Lachnosterna*.

A froghopper, *Clastoptera vittata*, Ball, is found abundantly on some cranberry bogs every year, and when present in great numbers, is considered very harmful. It usually infests dry bogs and apparently also those that are winter-flooded but not reflooded. Hibernation probably occurs in the egg-stage, which seems to survive the long flooding, but it has not been known to survive on bogs that are reflooded in the usual manner. The young nymphs begin to appear in late May or early June, and the spittle-masses increase in size and number until towards the end of July. The nymphs can be controlled by spraying with one part of Blackleaf 40 to 400 parts of water with 2 lb. resin fish-oil soap to 50 U.S. gals.; or 800 parts of water when the nymphs are very small. Adults have been reared from three species of *Vaccinium*, two of *Gaylussacia*, and from *Andromeda ligustrina*, *Leucothoe racemosa* and *Cassandra calyculata*. As these plants are abundant round many bogs they furnish a large source of infestation, but as reflooded bogs are not attacked, the progress of the insect from the uplands to the bogs must be very slow.

The Proctotrupid, previously noticed as the most important parasite of *Perrisia* (*Dasyneura*) *vaccinii*, Smith (cranberry tip worm), has been identified as *Ceraphron pallidiventris*, Ashm. It was bred in great numbers from the larvae in 1916 and 1917.

In the case of *Porthetria dispar*, L. (gipsy moth), the eggs do not survive very late holding of the winter water. Experiments with wind screens showed that 1,634 caterpillars were blown on to one acre of bog in the course of a season. One grower obtained good results by pouring 5 U.S. gallons of kerosene per 6 acres on a bog on which caterpillars about one-third grown were floating. Sprays of one part Blackleaf 40 to 400 parts of water killed the caterpillars in their early stages, but not when they were nearly full-grown.

The same spray is effective against *Rhopobota vacciniana*, Pack. (black-headed fireworm), as well as the spittle insect, and all may be treated by the same application on bogs that are winter-flooded but not re-flooded. If lead arsenate is added to the spray, it has the advantage of showing white where it has been applied, but in this case whale-oil soap must be substituted for resin to prevent scorching. It is now considered doubtful whether late holding of the winter flooding can be relied upon to eradicate *R. vacciniana* entirely, unless it is continued to 1st August. It seems better to let off the winter flooding about 1st June and re-flood from three weeks to a month later.

Mineola vaccinii, Riley (cranberry fruit worm) was found to be parasitised by the Chalcid, *Trichogramma minutum*, in 1917 to the unexpected extent of 83–89 per cent. on dry bogs and from 29–88 per cent. on those with winter flooding; in 1918 these figures were 36–89 per cent. and 0–15 per cent. respectively. Experiments in burying the larvae in sand showed that they can be smothered by sand about one inch thick, but that this must be applied after pupation, that is, after the middle of June.

A destructive invasion of *Agrotis ypsilon*, Rott. (greasy cutworm) occurred in August on a bog that had been flooded from early June to 10th July, in much the same way as that of *Laphygma frugiperda* (fall army worm) in 1916 [*loc. cit.*]. The cutworms

were first seen about 10th August and disappeared about the 24th. When confined together in numbers they seemed to be cannibalistic. They pupated in confinement in late August and early September, and the moths emerged from 18th September to 2nd October.

It is thought probable that there may be several more species that infest bogs that have been drained of their winter flood at midsummer. The moths of the fall army-worm apparently prefer to oviposit on bogs recently drained, and probably other species have similar habits. Moths collected on one bog a few days after the flood was let off on 10th August included *Nomophila noctuella*, Schiff., *Caenurgia* (*Drasteria*) *erechtea*, Cram., and *Syngrapha* (*Autographa*) *falcifera* var. *simplex*, Gn. None of these was found on any bog that had the winter flood let off early, and no infestation of caterpillars occurred later where the moths had appeared.

FROST (C. A.) & WEISS (H. B.). **A Bibliography of the Literature on the described Transformations and Food Plants of North American Species of** *Agrilus* **(Col.).**—*Canad. Entom., London, Ont.*, lii, no. 10, October 1920, pp. 220–223.

This is the second instalment of a paper previously noticed [*R.A.E.*, A, viii, 516]. The species of economic importance dealt with include *A. politus*, Say (oak twig-girdler), *A. burkei*, Fish., infesting alders, *A. viridis*, L., var. *fagi*, Ratz., infesting roses, *A. sinuatus*, Ol. (sinuate pear borer), *A. fallax*, Say, infesting honey locust, *A. obsoletoguttatus*, Gory, infesting beech and oak, and *A. egenus*, Gory, infesting hickory and *Robinia*.

WEISS (H. B.) & WEST (E.). **Notes on** *Galerucella nymphaeae*, **L., the Pond-Lily Leaf-beetle. (Col.).**—*Canad. Entom., London, Ont.*, lii, no. 10, October 1920, pp. 237–239.

Galerucella nymphaeae, L. (water-lily leaf-beetle) occurs throughout New Jersey on the yellow water-lily (*Nymphaea advena*), damaging the leaves and flowers. Hibernation probably occurs in the adult stage. The eggs are deposited on the leaf in clusters of up to 20, and hatch in about a week. The young larvae feed in colonies on the upper layers of the leaf tissue, causing irregular bare patches ; as they become larger, they separate and feed independently on either side of the leaf. In New Jersey many individuals become full-grown about the third week in June, and pupation occurs on the leaf surface, lasting about a week. There are at least two generations ; from the middle to the end of June all stages except eggs may be found.

Other food-plants of *G. nymphaeae* that have been recorded include several aquatic species and also basket willows and beans.

This beetle is evidently an imported pest, and is abundant in Northern Europe and Siberia, as well as being widely distributed in the United States. A description of the early stages is given.

According to Chittenden arsenicals are effective in checking the beetle on willow, and for aquatic plants he suggests flooding, with a few drops of oil on the water to destroy the floating insects. It was noticed that the insect was absent in areas where the water-lilies were entirely covered by the tide each day.

BUSCK (A.). **A New** *Gracilaria* **injurious to Avocado (Lepid.).**—*Canad. Entom., London, Ont.*, lii, no. 10, October 1920, p. 239, 3 figs.

Gracilaria perseae, sp. n., is described from avocado in Florida, where it was bred from the leaves. This moth is said to be seriously

destructive to the young growth. The larvae make a small mine between the veins of the young leaves and then fold the tip or the sides of the leaf downwards. The cocoon is spun in a fold on the leaf. This species resembles *G. violacella*, Clem., and *G. burserella*, Busck, but differs in the characters of the male genitalia.

Stuckey (H. P.) & Higgins (B. B.). **Spraying Peaches.**—*Georgia Expt. Sta., Experiment*, Bull. 135, December 1919, pp. 91–101. [Received 1st December 1920.]

Formulae and directions for the best sprays to use under Georgia conditions on peach-trees against both fungus diseases and insect pests are given. For the peach-tree borer [*Aegeria exitiosa*] the soil is raked away from the trees to the depth of an inch or two during the latter half of July ; asphaltum is then applied to the base of the trees, extending six or eight inches above the ground. The soil is then replaced. This prevents oviposition, which normally occurs during August and early September. If any infestation follows this treatment, the larvae should be extracted in November.

A schedule is given for summer spraying of peaches, and the necessary equipment is described.

Kirby (A. H.). **Plant Pathology.**—*Nigeria : Ann. Rept. Dept. Agric., Southern Provinces for 1919, Lagos,* 1920, pp. 17–18. [Received 2nd December 1920.]

As a result of a severe infestation of maize by *Calandra oryzae, Tribolium castaneum* and *Tenebroides mauretanicus*, experiments with carbon bisulphide as a fumigant were made. After fumigating shelled maize for 24 hours with 5 lb. of fumigant to 1,000 cu. ft., all the beetles were dead. The maize was then stored in sacks in native pots with well-fitting wooden covers, a layer of wood ash being placed on the maize before adjusting the covers. The pots were then sealed with mud from termite nests. Maize thus stored proved insect-free when inspected after one month.

The difficulty experienced in establishing the native indigo is due to continued insect attack. The pests involved include :—the large grasshopper *Zonocerus variegatus*, leaf-eating beetles belonging chiefly to the genera *Syagrus* and *Crioceris*, and Arctiid caterpillars.

Watson (J. R.). **New Thysanoptera from Florida, vii.**—*Florida Entom., Gainesville,* iv, no. 2, September 1920, pp. 18–23, 27–30. [Received 6th December 1920.]

The new species described include :—*Haplothrips gracilis*, on ironweed (*Vernonia*) ; *Hoplandrothrips quercuspumilae*, and *Myrmecothrips querci*, gen. et sp. n., on *Quercus pumila ; Chirothrips floridenis*, on Bermuda grass ; *Haplothrips cassiae*, on blossoms of *Cassia* ; *H. funki*, on *Quercus falcata ; H. querci*, on scrub oak ; and *H. tiliae*, on basswood (*Tilia americana*).

Keys are given to the North American species of *Hoplandrothrips* and *Chirothrips* and also to the characters of the genera *Cephalothrips, Dolichothrips* and *Myrmecothrips*.

Wilson (H. F.) & Vickery (R. A.). **A Species List of the Aphididae of the World and their recorded Food Plants.**—*Trans. Wisconsin Acad. Sci. Arts and Letters, Madison,* xix, pt. 1, November 1918, pp. 22–355. [Received 7th December 1920.]

This work is divided into two parts, the first being a species list of the Aphididae of the world with their recorded food-plants, the second

giving a list of the food-plants and the Aphids said to attack them. The importance of the information is increased by the fact that the majority of species of Aphids are confined to certain definite food-plants, so that the determination of any one species is made more easy when the food-plant upon which it occurs is known.

CUSHMAN (R. A.). U.S. Bur. Entom. **North American Ichneumon-flies, new and described, with Taxonomic and Nomenclatorial Notes.**—*Proc. U.S. Nat. Mus., Washington, D.C.*, lviii, no. 2334, 1920, pp. 251–292.

This paper includes corrections to Viereck's "Type Species of the Genera of Ichneumon-flies" [*R.A.E.*, A, ii, 182] and many additions to the author's previous papers. Descriptions are given of one new genus, one new subgenus and 23 new species of Ichneumonids, and three new species of Braconids.

Among the new species are *Phaeogenes arcticus*, parasitic on *Peronea* sp. on spruce and hemlock; *Spilocryptus propodeum*, parasitic on *Polychrosis viteana*, Clem.; *Phthorima extensor*, taken from an Aphid gall on witch-hazel; *Angitia galleriae*, a parasite of *Galleria mellonella*; *Pristomerus ocellatus*, said to have been reared from stems of *Polymnia uvedalia*, infested by the weevil, *Rhodobaenus tredecimpunctatus*; *P. minutus*, reared from a Cecidomyid gall on juniper; and *P.* (*Neopristomerus*) *melleus*, reared from *Gelechia* sp. on tobacco and from *Elasmopalpus lignosellus*.

The new Braconids are:—*Bassus acrobasidis*, from *Acrobasis* sp. on pecan; *Orgilus gelechiaevora*, from *Gelechia trialbamaculella*; and *Habrobracon erucarum*, from *Euxoa* sp.

FLETCHER (T. B.) & INGLIS (C. M.). **Some Common Indian Birds: no. 5. The Golden-backed Woodpecker** (*Brachypternus aurantius*).—*Agric. Jl. India, Calcutta*, xv, part 5, September 1920, pp. 481–484, 1 plate. [Received 7th December 1920.]

Brachypternus aurantius is common throughout India and Ceylon up to elevations of 3,000 to 4,000 ft. Ants form a considerable portion of its normal food. In Eastern Bengal these woodpeckers also feed on the larvae and pupae of the Longicorn, *Hoplocerambyx spinicornis*, which infests sal (*Shorea robusta*), and in Madras they frequent the toddy palms, probably because of the presence of *Oryctes rhinoceros* and *Rhynchophorus ferrugineus*. They are also often seen on dead branches of sissu infested with the termite, *Coptotermes heimi*. These birds are protected by law throughout the whole year in Bengal, Burma, Madras, Bombay and Assam.

HENRY (A.). **Danger to Sitka Spruce from** *Chermes cooleyi*.—*Gardeners' Chron., London*, lxviii, no. 1768, 13th November 1920, p. 242.

Attention is drawn to the continued spread of *Chermes cooleyi* on Douglas fir in Britain. As this Aphid is a dangerous enemy of Sitka spruce in British Columbia, steps should be taken to have any suspected material investigated.

COLLINGE (W. E.). **The Rook: Its Relation to the Farmer, Fruit Grower and Forester.**—*Jl. Minist. Agric., London*, xxvii, no. 9, December 1920, pp. 868–875, 4 figs.

An account is given of the methods of expressing the percentages of the various items of food found in a bird's stomach, so that by

comparing them a conclusion may be reached as to whether the bird is harmful or beneficial to agriculture. These methods are applied in detail in the case of the rook, which has been becoming increasingly abundant in Britain of recent years. From the figures given it is estimated that 10,000 of these birds consume in a year about 232 tons of food, and in obtaining this they destroy about 80 tons of cereals, 32 tons of potatoes and roots, 7½ tons of beneficial insects, and 65 tons of injurious insects, slugs, snails, etc., the rest of their food having no economic importance. It is not considered probable that this bulk of injurious insects, if they had not been destroyed by the rooks, would have done as much damage as the latter, as a considerable percentage would have been eaten by starlings, jackdaws and black-headed gulls.

On the other hand the large amount of cereals destroyed is thought to be due to a change in food preference, following on the increase in the rook's numbers. In all probability there are too many rooks feeding on the same food in a given area, and that which is most plentiful and most easily procured is taken.

Even when reduced in numbers the rook would still feed on cereals to a certain extent, but the percentage would be lower ; and it would benefit the farmer to lose such a percentage in order to have destroyed the greater percentage of injurious insects, many of which, such as wireworms, leather-jackets, ground caterpillars and weevils, could not be so thoroughly or economically attacked in any other way.

Repressive measures are, consequently, recommended, but not reckless and wanton destruction, so that the rook may be brought back to its normal position, in which it is one of the most useful of birds.

SCHLUPP (W. F.). **Mylabris Beetles.**—*Jl. Dept. Agric., Union S. Africa, Pretoria,* i, no. 8, November 1920, pp. 741–749, 3 figs.

A short account is given of the life-history and economic status of blister-beetles (MELOIDAE) in various parts of the world, and of the preparation and properties of cantharides. In South Africa the beetles injure the flowers of fruit trees, beans, peas, etc., but it is doubtful if the setting of the fruit is interfered with, and their numbers and the damage they do is often greatly overestimated. If severe injury is done, however, the beetles should be destroyed. Even if their larvae do attack grasshoppers (which is uncertain), the latter feed chiefly on grasses on the veldt that are of small value compared with the crops the beetles destroy. Spraying is not a satisfactory method of destroying the beetles, but systematic hand-collection is much more effective than might be expected. The cool, early morning is the best time, as the beetles are then least active. They may be disposed of by dropping them into water on which a little paraffin oil is floating.

The commercial possibilities of these beetles in South Africa are negligible. The demand for cantharides is very limited, and though the South African species yield a larger amount of cantharidin than the "Spanish Fly," *Lytta* (*Cantharis*) *vesicatoria,* they are not, like it, gregarious, so that the labour involved in collection would be many times as great. It takes a thousand dried beetles to weigh a pound, and even where the beetles appear fairly numerous there are probably only about half that number to an acre. If it should ever become worth while to use them for commerce, they are best killed with carbon bisulphide.

Of the MELOIDAE observed in South Africa the most numerous are *Mylabris oculata, M. lunata,* and *Cyaneolytta subcoriacea.*

ANDREWS (E. A.). **Address on the Control of the Mosquito Blight of Tea** (*Helopeltis theivora,* **Waterh.) given by the Entomologist before the Committee of the India Tea Association (London).**—*Qtrly. Jl. Scient. Dept., Ind. Tea Assoc., Calcutta,* 1920, pt. iii, pp. 67–82.

The more important conclusions drawn from the investigations recorded in this paper have been previously noticed [*R.A.E.*, A, viii, 204]. Natural means of control of *Helopeltis theivora* (mosquito blight) on tea in India are not promising. A Mermithid worm destroys perhaps 2 per cent. of the insects ; it is thought that in China or Japan, where damage by *H. theivora* is apparently never recorded, there may be some effective parasite that might be successfully imported.

The bionomics of this Capsid are discussed, and a chart shows the seasonal history. As all stages of several generations are present at once, there is no specific period when the application of insecticides can be recommended with confidence. Lime-sulphur can be used with success against the adults on small areas, if the treatment is begun early in the season and is given repeatedly and efficiently. Fumigation has also given some success when the infestation was not too severe and when the evening breezes were favourable ; tests are to be made with some of the newly-discovered poison gases. The possibility of controlling this pest indirectly, by treatment of the plants, has already been discussed at length [*loc. cit.*].

STIFT (A.). **Ueber im Jahre 1919 veröffentliche bemerkenswerte Arbeiten und Mitteilungen auf dem Gebiete der tierischen und pflanzlichen Feinde der Zuckerrübe.** [Works and Communications of Value published in 1919 concerning the Animal and Vegetable Enemies of the Sugar Beet.]—*Centralbl. Bakt., Parasit. u. Infektionskr., Jena,* IIte Abt., lii, no. 9–12, 10th November 1920, pp. 244–252.

The subject-matter of this review is indicated by its title.

CECCONI (G.). **Manuale di Entomologia Forestale.**—*Florence,* Fasc. 8, 1920, 64 pp., 71 figs. [Received 7th December 1920.]

The eighth part of this work [*R.A.E.*, A, vii, 351] covering pp. 449–512 concludes the section on Coleoptera and begins the description of the Diptera ; many of these are beneficial, being enemies of other insects that are forest pests.

DEGRULLY (L.). **Les Traitements d'Hiver contre Cochylis et Eudémis.** [Winter Treatments against *Clysia ambiguella* and *Polychrosis botrana.*]—*Progrès Agric. & Vitic., Montpellier,* lxxv, no. 49, 5th December 1920, pp. 533–539, 3 figs.

The infestation of French and Algerian vineyards in 1920 by *Clysia ambiguella* and *Polychrosis botrana* has been considerable, although perhaps more definitely localised than in preceding years. The importance of preventive winter treatments and of preventive and remedial measures in summer is emphasised, and the principal winter treatments are described and the necessary tools illustrated.

GHIRLANDA (C.). *Botrytis bassiana* (**the Silk-worm "Mucsardine") in the Control of the Pine Bombyx,** *Thaumetopoea* (*Cnethocampa*) *pityocampa.—Il Coltivatore, Casale Monferrato,* lxv, no. 21, 30th July 1919, pp. 329–423. (Abstract in *Mthly. Bull. Agric. Intell. & Pl. Dis., Rome,* x, no. 10–12, October–December 1919, pp. 1290–1291.) [Received 7th December 1920.]

Attention is drawn to the possibility of carrying out experiments on a large scale for the purpose of propagating *Botrytis bassiana* (silkworm muscardine fungus) to destroy the larvae of *Cnethocampa pityocampa* [*cf. R.A.E.*, A, vii, 385]. This fungus can grow on various media, but to obtain a pure culture, free from the other microbic forms usually accompanying it, those with an acid reaction must be used.

When the fungus has reached the complete stage of spore formation, a homogeneous mixture with some inert powder (diatomaceous earth, talc, etc.) should be obtained, and the infecting material thus formed can be applied with a bellows sprayer. The most suitable time for dissemination is the end of August or the beginning of September, when the maximum number of caterpillars is present. They would thus be attacked before they migrate in search of food, and the action of the fungus would be much more rapid and deadly, because the caterpillars are then very small.

The application should preferably be made at night, when the larvae are leaving their nests and can most easily be reached. If it is made by day, care should be taken to direct the powder upon the nests so that the caterpillars on coming out are readily covered and thus become infected.

DE STEFANI (T.). **Animal Pests of the Castor-oil Plant** (*Ricinus communis*) **in Sicily, Italy.**—*Boll. Studi. inform., R. Giard. Colon. Palermo,* v, pts. 1–2, 1919, pp. 39–47. (Abstract in *Mthly. Bull. Agric. Intell. & Pl. Dis., Rome,* x, no. 10–12, October–December 1919, p. 1293.) [Received 7th December 1920.]

In June 1918 young castor-oil plants (*Ricinus communis*), the leaves of which were yellow and flaccid, were found to be attacked by the mite, *Tetranychus telarius* var. *russeolus*. *Laphygma* (*Caradrina*) *exigua* is the only pest that has been previously reported as attacking castor-oil plants in Sicily, and this moth has done very little harm.

A number of the larvae of a predatory beetle, *Stethorus punctillum*, was present among these mites and did great execution. The adult beetles were observed from the middle of June to the beginning of July.

MARCHAL (P.) & POUTIERS (R.). **La Fourmi d'Argentine.** [The Argentine Ant.]—*Bull. Agric. Algér. Tun. Maroc; Algiers,* xxvi, no. 10, October 1920, pp. 215–217.

An account is given of the Argentine ant, *Iridomyrmex humilis*, in the south of France, and of the usual methods employed to prevent its depredations [*R.A.E.*, A, i, 325, v, 247, viii, 326, etc.].

Désinfection des Plants de Vignes racinés. [Disinfection of rooted Vine Slips.]—*La Terre Vaudoise, Lausanne,* xii, no. 49, 4th December 1920, p. 491.

Attention is called to the necessity of disinfecting rooted vine slips in the vineyards of Vaud for *Phylloxera* ; this is compulsory in accord-

ance with the Federal decree, by which a disinfectant composed of 3 per cent. potassium sulpho-carbonate and 1 per cent. black soap is supplied free for use in each community under the supervision of an official.

Vayssière (P.). **Les Insectes nuisibles aux Cultures du Maroc. (2e Note.)**—*Bull. Soc. Entom. France, Paris,* 1920, no. 15, 13th October 1920, pp. 256–259.

This list of noxious insects in Morocco, continued from a previous paper [*R.A.E.*, A, viii, 121], includes :—Coleoptera : *Hesperophanes fasciculatus,* Fald., taken on fig-trees. Lepidoptera : *Prays oleae,* F., on the leaves of olive-trees. Diptera : *Mayetiola destructor,* Say, causing much damage to wheat and barley ; *Ceratitis capitata,* Wied., infesting fruit ; *Dacus oleae,* Rossi, on olives. Rhynchota (exclusive of Aphids and Aleurodids, which will be dealt with later) : *Euphyllura olivina,* Costa, an important olive pest ; *Parlatoria calianthina,* Berl. & Léon., on olives ; *P. zizyphi,* Lucas, on oranges ; *Lepidosaphes beckii,* Newman (*citricola,* Pack.), on *Citrus* spp. ; *Aspidiotus hederae,* Vall., on oleanders and olives ; *A.* (*Aonidiella*) *maleti,* sp. n., on olives ; *Chrysomphalus minor,* Berl. & Léon. ; *Chionaspis ceratoniae,* March., on carobs and olives ; *C. etrusca,* Léon., on *Tamarix* ; *C. nerii,* Newst., on oleanders ; *Saissetia oleae,* Bern. ; *Coccus* (*Lecanium*) *hesperidum,* L. ; *Ceroplastes rusci,* L. ; *C. sinensis,* Del G. ; *Pseudococcus citri,* Risso, on *citrus* ; *Kermes vermilio,* Planch., on oak ; *Margarodes parieli,* sp. n., on barley ; and *Icerya purchasi,* Mask., on various fruit and ornamental trees, against which *Novius cardinalis* is being introduced.

de Peyerimhoff (P.). **Nouveaux Coléoptères du Nord-Africain : Trente-sixième Note. Anobiidae Parasites du Cèdre et du Pin d'Alep.**—*Bull. Soc. Entom. France, Paris,* 1920, no. 16, 27th October 1920, pp. 266–268, 2 figs.

The new species here described from northern Africa are *Ernobius fructuum,* from dry cedar cones infested with larvae of *Dioryctria peltieri,* Joann. ; *Anobium* (*Coelostethus*) *pineti,* from a decayed trunk of Aleppo pine [*Pinus halepensis*], and *A. pineti cedretorum,* subsp. n., from a dry cedar trunk.

de Seabra (A. F.). **Etudes sur les Maladies et les Parasites du Cacaoyer et d'autres Plantes cultivées à S. Thomé. xxiv. Le** *Dysdercus superstitiosus* **à S. Thomé.**—*Lisbon,* Companhia Agricola Ultramarina, 1920, 6 pp., 4 figs. [Received 11th December 1920.]

Dysdercus superstitiosus is found in San Thomé on *Eriodendron anfractuosum, Bombax* sp. and cacao. On the latter plant individuals were noticed in February. The coloration of this cotton-stainer apparently varies as a result of different food-plants. The remedial measures suggested by Peacock [*R.A.E.*, A, ii, 106] are advocated. The natural enemies include a Myrmelionid that is very common on the Island.

de Seabra (A. F.). **Etudes sur les Maladies et les Parasites du Cacaoyer et d'autres Plantes cultivées à S. Thomé. xxv. Les Cochenilles du Cocotier à S. Thomé.**—*Lisbon,* Companhia Agricola Ultramarina, 1920, 5 pp. [Received 11th December 1920.]

Many of the Coccids here recorded have been previously mentioned [*R.A.E.*, A, vi, 384 ; viii, 492] ; they include *Aulacaspis pentagona*

commonly infesting a species of *Loranthus*, probably *L. javanicus*, a plant parasitic on cacao, as well as cacao itself, and less frequently coconut palms. Its numbers are greatly reduced by the fungus *Microcera coccophila*. *Aspidiotus palmae* is especially abundant on avocado. Coconuts are also attacked by *A. articulatus*, an unidentified species of *Lecanium*, and *Ischnaspis longirostris* (*filiformis*).

de Seabra (A. F.). **Etudes sur les Maladies et les Parasites du Cacaoyer et d'autres Plantes cultivées à S. Thomé. xxvi. L'*Araecerus fasciculatus* à S. Thomé.**—*Lisbon*, Campanhia Agricola Ultramarina, 1920, 4 pp. [Received 11th December 1920.]

Araecerus fasciculatus, although introduced in the larval stage among cacao berries or dried branches of coffee, has not yet become established in San Thomé. To prevent injury the suggestions made by Mayné [*R.A.E.*, A, vi, 79] are advocated ; these include clean storage and the removal of infested fruits from the trees. Dried berries should not be stored for very long.

No parasites of this beetle have yet been discovered in San Thomé.

de Seabra (A. F.). **Etudes sur les Maladies et les Parasites du Cacaoyer et d'autres Plantes cultivées à S. Thomé. xxvii. Note sur l'Importance agricole de l'*Aulacaspis pentagona* à S. Thomé.**—*Lisbon*, Campanhia Agricola Ultramarina, 1920, 4 pp. [Received 11th December 1920.]

The natural enemies of *Pseudaonidia trilobitiformis* and *Aulacaspis pentagona* in San Thomé include the fungus *Microcera coccophila*. The importance of fungous diseases in the control of scale-insects and their value to agriculture is emphasised [*R.A.E.*, A, viii, 492].

de Seabra (A. F.). **Etudes sur les Maladies et les Parasites du Cacaoyer et d'autres Plantes cultivées à S. Thomé. xxviii. Note sur l'Habitat de l'*Aspidiotus articulatus* à S. Thomé.**—*Lisbon*, Companhia Agricola Ultramarina, 1920, 4 pp. [Received 11th December 1920.]

In San Thomé *Aspidiotus articulatus* has been found infesting cacao, coffee, coconut, avocado and even *Citrus*, but it has never been sufficiently abundant to be of any economic importance. The favourite food-plant is apparently *Lonchocarpus* sp.

de Seabra (A. F.). **Etudes sur les Maladies et les Parasites du Cacaoyer et d'autres Plantes cultivées à S. Thomé. xxx. Encore le Thrips du Cacaoyer (*Heliothrips rubrocinctus*, Giard) à S. Thomé.**—*Lisbon*, Companhia Agricola Ultramarina, 1920, 5 pp. [Received 11th December 1920.]

The food-plants of *Heliothrips rubrocinctus*, Giard, include *Claoxylon molleri*, *Copaifera mopane*, *Manihot utilissima*, *Pseudospondias microcarpa*, *Psidium pomiferum* and *Urophyllum insulare*. It also attacks mango and kola plants. Owing to the habits of *H. rubrocinctus*, it is doubtful whether tobacco would be of any use as a trap crop [*R.A.E.*, A, viii, 492]. Apparently this thrips does not fly very much, and only accidentally alights on tobacco plants when carried by the wind. As a pest of cacao in San Thomé, it is probably not as important as it at first appeared to be, but its further spread should be guarded against.

Está criado o Instituto Biologico de Defesa Agricola. [Foundation of the Biological Institute for Agricultural Defence.]—*Chacaras e Quintaes, S. Paulo,* xxii, no. 5, 15th November 1920, p. 355, 1 fig.

The Brazilian Ministry of Agriculture has established a Biological Institute for Agricultural Defence on the lines adopted by other countries. Dr. Carlos Moreira, up to now Chief of the Entomological Laboratory of the National Museum, has been appointed director of the new institution.

Os Insectos damninhos. ix. O Caruncho da Madera, *Lyctus brunneus,* **Stephens.** [Injurious Insects. ix. The Timber Beetle, *L. brunneus.*] —*Chacaras e Quintaes, S. Paulo,* xxii, no. 5, 15th November 1920, pp. 372–373, 1 fig.

Lyctus brunneus is known in Europe and Australia, and probably occurs throughout Brazil, though it has only been recorded there quite recently. The female oviposits in felled timber as soon as the bark has dried. In Brazil a Clerid, *Tarsostenus univittatus,* Rossi, and some Braconid enemies of it have been discovered. Froggatt has recorded a Braconid parasite in Australia [*R.A.E.*, A, viii, 333]; there must be many species of these in Brazil, as several hundred parasites emerged from infested timber under observation.

Swezey (O. H.). **The Olapa Weevil,** *Nesotocus giffardi.—Hawaiian Planters' Record, Honolulu,* xxiii, no. 5, November 1920, pp. 264–267, 7 figs.

Most of the information here given on *Nesotocus giffardi,* an endemic Hawaiian weevil that attacks the native olapa tree (*Cheirodendron*) has already been noticed [*R.A.E.*, A, viii, 434].

Insect Pests and Plant Diseases.—*Rept. Agric. Dept., Grenada, April–December 1919*; *Barbados,* 1920, pp. 6–7. [Received 15th December 1920.]

The pests recorded include the acrobat ant [*Cremastogaster* sp.] which is widespread and causes damage to the cushions of the cacao tree, thereby reducing bearing. Mealy-bugs [*Pseudococcus*] are often found in association with this ant. At present experiments are being carried on with crude oil applied to the ants' nests and torch fires for the destruction of leaves and pods on the trees where mealy-bugs are found. This latter method is not advocated. Localised attacks of *Heliothrips rubrocinctus,* Giard (cacao thrips) are recorded. Bordeaux-nicotine and soap-nicotine washes were used, but it is evident that spraying is useless unless accompanied by good cultivation and efficient drainage. *Aspidiotus destructor* (coconut scale) was particularly in evidence during the dry months of April and May. *Rhynchophorus palmarum* (palm weevil) was observed on coconut palms, dying or dead as the result of Nematode attacks. *Tomaspis saccharina,* Dist. (froghopper) caused damage to sugar-cane ratoons of about twelve years standing. Large areas of maize were destroyed by *Diatraea saccharalis,* F. (cane moth borer). The pests of limes included *Chionaspis citri* (orange snow scale), *Lepidosaphes beckii* (orange mussel scale) and *Coccus viridis* (green scale).

Polistes annularis (Jack Spaniard), introduced from St. Vincent, has for some reason or other become almost extinct, but the common Grenada wasp, *Polybia occidentalis,* is abundant everywhere.

Jackson (T.). **Control of Cotton Stainers in St. Vincent.**—*Agric. News, Barbados,* xix, no. 483, 30th October 1920, p. 347.

In spite of the fact that there are now in St. Vincent no food-plants for cotton-stainers [*Dysdercus* spp.] to breed on during certain months of the year, there have probably been more stainers present during 1920 than in 1919. This is thought to be due in large measure to the use of cotton-seed meal as manure ; when this is not covered sufficiently deep it is possible that numbers of the bugs are able to breed on it for a limited time. A large quantity of cotton was spoilt in the fields on account of heavy rains, and much débris was left lying exposed to insect attack. The area under cotton was also greatly increased from the normal, so that there would naturally be a greater number of insects present. Every effort should be made to destroy as many stainers as possible at the end of every crop before they leave the field. When plants are being destroyed, traps should be laid ; these may be expected to be effective, as it is improbable that the insects would leave an abundant food-supply for less attractive plants. The adequate covering of cotton-seed manure also requires attention.

Fernald (H. T.) & Bourne (A. I.). **Department of Entomology.**—*32nd Ann. Rept. Mass. Agric. Expt. Sta., Amherst,* Parts i and ii, 1919 (1920), pp. 31a–37a. [Received 18th December 1920.]

The work in connection with tests of standard insecticides, studies on digger wasps, the onion maggot [*Hylemyia antiqua*] and codling moth [*Cydia pomonella*] have been continued as in previous years [*R.A.E.*, A, viii, 75]. The second generation of the codling moth, if it exists at all, is probably not large enough to need consideration. Observations to ascertain the best time for the second spring spraying for this pest are still in progress. *Plathypena scabra,* F. (green clover worm) was extremely abundant during 1919, causing serious injury to beans. Its attacks were first noticed in eastern Massachusetts during the latter half of July, and later it was found farther west. Repellent and insecticidal dusts, as well as contact insecticides, have proved useless against this moth, probably partly owing to the habit of the larvae of dropping to the ground when disturbed. A lead arsenate spray applied before the leaves are badly riddled proved a successful remedial measure, but should it be applied when the pods are nearly ready for picking, the beans will require thorough washing before they can be used. Lead arsenate powder also proved successful, but is difficult to apply evenly, and when applied too thickly, it injures the leaves.

The European corn borer [*Pyrausta nubilalis*] has apparently spread beyond its known limits.

Potato spraying experiments have been continued, various commercial brands of lead arsenate, calcium arsenate and magnesium arsenate having been tested in combination with Bordeaux mixture. These three materials appear to be equally good, except as to suspension quality and cost. The results obtained with 4–4–50 Bordeaux mixture combined with powdered calcium arsenate are equal to those obtained with lead arsenate or magnesium arsenate, but the cost is lower. Sulfoleum proved effective against Aphids, but not quite as good as nicotine sulphate. Its chief objection is the injury it causes to foliage. As a cluster-bud spray for apple trees, it was apparently successful against red bugs [*Heterocordylus*], and did not injure the leaves.

Locusts and their Control.—*Bull. Imp. Inst., London,* xviii, no, 2. April–June 1920, pp. 256–270.

The biology of locusts in general is described, and the remedial measures advocated against them in various countries are reviewed. Several spray formulae for them are quoted, and their bacterial and fungoid diseases are briefly discussed.

BAER (W.). **Die Tachinen als Schmarotzer der schädlichen Insekten. Ihre Lebensweise, wirtschaftliche Bedeutung und systematische Kennzeichnung.** [Tachinids as Parasites of injurious Insects. Their Life-History, Economic Importance, and Systematic Characters.]—*Zeitschr. angew. Entom., Berlin,* vi, no. 2, February 1920, pp. 185–246, 63 figs. [Received 2nd December 1920.]

The hosts of TACHINIDAE are not limited to Arthropods, for mammals, birds, reptiles, etc., are parasitised by the OESTRINAE, CALLIPHORINAE, and SARCOPHAGINAE, but the chief sub-families, TACHININAE, DEXIINAE, RHINOPHORINAE, and PHASIINAE, confine themselves to Arthropods, especially insects. No stage, and scarcely any large group, is spared, and the most sheltered habitat, even under water, affords no protection. In Central and Northern Europe there are 400–450 species of these flies parasitising insects.

They appear early and disappear late in the year, and are found in the far North. *Tachina larvarum*, L., occurs in Greenland, and *Peletieria aenea*, Staeg., and *Petina stylata*, B.B., a parasite of *Dasychira groenlandica*, Wck., are peculiar to that country.

The adult Tachinids are chiefly found on flowers, in summer those of Umbelliferae being the most attractive. They also feed on decomposing matter, and live for a fairly long time. Examples of *Ernestia rudis* found in August had apparently emerged in May, and in captivity the female of *Helibosca muscaria* can live for 8 or 9 weeks. In favourable weather mating takes place on the days immediately following emergence. The male appears to be mature on leaving the cocoon, but the female requires a further 2, 3, or more weeks to attain maturity, a period that may be prolonged at low temperatures. A few species of the genera *Meigenia, Compsilura* and *Lydella* seem to mature in 3–4 days in sunny weather.

Some species deposit their eggs within the host, and others in proximity to it, on the food-plant. The latter eggs either hatch after they have been inadvertently ingested, or the larvae remain fully developed in the shell until a suitable host touches them. The number of eggs laid varies considerably. *Eudoromyia magnicornis* has furnished a count of 3,200 eggs ; *Sturmia sericaria* one of over 5,000, according to Sasaki ; and *Helicobosca muscaria*, Mg., a minimum of 3.

Descriptions are given of the method of penetration into the host, the shape of the larva, the larva's three stages, and its life within the host. The larvae may be divided into 3 groups according as to whether they remain in direct communication with atmospheric air, in secondary (direct or indirect) communication, or become entirely cut off. The larval period is usually short—about 3 weeks for *Parasetigena* and as little as 6 days for *Meigenia floralis*; but this may be prolonged by a resting or hibernation period in the host. For instance, *Sturmia bimaculata*, parasitising the summer generation of *Diprion* (*Lophyrus*) *pini*, matures in a few weeks. Some larvae of *Sturmia*, however, parasitise examples of this sawfly that are entering the latent period, and such larvae emerge in the following spring.

If parasitism has begun early enough in a caterpillar or other host, the victim is unable to progress to a further stage. This is the rule with *Ernestia rudis, Erycia aurulenta,* and *Ptychomyia.* Some species emerge from the pupa as well as from the larva of the host. *Erynnia nitida* has been said sometimes to emerge from adults of *Galeruca.*

Pupation usually takes place just beneath the surface of the ground. Among the species that do not pupate in the ground are *Sturmia nidicola* and *Eudoromyia magnicornis,* which do not leave the host caterpillars. The pupal stage may be as short as a week ; *Arrhinomyia innoxia,* Meig., usually requires 3 weeks, but at 94° F. (35° C.) 1 week suffices.

Most Tachinids are polyphagous ; *Compsilura concinnata* has 67 hosts ; *Bucentes cristata* attacks *Tipula maxima,* living in water, and various caterpillars. *Ceromasia inclusa, Diplostichus, Trichoparia,* and *Sesiophaga* are the only monophagous Tachinids known.

There are from one to three generations a year. *Compsilura* and *Lydella nigripes* have a complete third generation, at least. Different generations often have different hosts. In spring *Phryxe vulgaris* attacks *Hibernia* and *Cheimatobia,* and its second generation attacks *Orgyia.*

The efficiency of Tachinids may reach 100 per cent. in outbreaks of insect pests, their increase becoming very marked when the hosts become abundant. Among the causes that check their increase are unfavourable conditions for finding a host ; even eggs that are laid on a host may be lost with the latter's cast skin. Fungi, such as *Empusa* and *Spicaria,* and Chalcid hyperparasites also check Tachinids. Still more important are flies of the genus *Anthrax.* During recent nun-moth outbreaks the extraordinary increase of *Hemipenthes* (*Anthrax*) *morio,* L., gave reason to fear a decrease of Tachinid parasitism. Another check is the unsuitability of the available host, which raises the question as to whether polyphagous or monophagous species are the more beneficial. The former exercise a preventive action that uniformly checks the host, whereas the latter exercise a curative action by appearing in large numbers following on a rapid increase of their specific host.

Notes are given on methods of investigating the extent of parasitism, on the avoidance of combative measures disadvantageous to the parasites, and on cultural methods favourable to them. The best-known example of such cultural methods is the growing in vineyards of *Euonymus* and other food-plants of *Hyponomeuta* in order to encourage the latter's parasites, which are also parasites of the vine-moths [*R.A.E.*, A, viii, 356].

The successful establishment in North America of Tachinid parasites of the brown-tail moth [*Nygmia phaeorrhoea*] and gipsy moth [*Porthetria dispar*] is instanced ; in new territory hyperparasites are absent at first if care is taken not to import them with the beneficial species.

When an outbreak is declining in a given area and spreading elsewhere, it is profitable to use the superfluous parasites in the first district, thus counterbalancing the advantage of time usually possessed by the host. After an outbreak of the nun-moth [*Liparis monacha*] or pine-moth [*Panolis flammea*], the cocoons of *Parasetigena* and *Ernestia* should be collected for use elsewhere. Large numbers may be obtained by confining parasitised mature caterpillars in a narrow space. *Lydella nigripes,* Fall., and *Carcelia rutilla,* B.B., leave the pupa [of *Bupalus piniarius*] a few weeks before the latter's flight

period ; the pupae should be taken when required and kept under netting permitting the Tachinids to escape.

A good method of breeding Tachinids is to place the host cocoons in flowerpots or wire-gauze cylinders sunk in the ground and covered with moss, etc.

Kleine (R.). **Die Wintersaateule,** *Agrotis segetum,* **Schiff., und ihre Bedeutung als landwirtschaftlicher Schädling.** [*Euxoa segetum* and its Importance as an agricultural Pest.]—*Zeitschr. angew. Entom., Berlin,* vi, no. 2, February 1920, pp. 247–269, 1 map. [Received 2nd December 1920.]

The severe outbreak of *Euxoa* (*Agrotis*) *segetum* in Germany in 1915 was followed by one of a ruinous character in 1917. In 1918 very little damage was done. The investigations here described were made in Pomerania ; Zimmermann's observations in Mecklenburg have already been noticed [*R.A.E.*, A, vi, 444].

The outbreaks are quite sudden, as the individuals normally found are capable of increase within a year to devastating multitudes.

Weather exercises more influence than has been supposed, and may be almost the sole cause of a severe outbreak. In 1915 and 1917 the weather was dry ; in 1916 and 1918 it was wet. The winter of 1916–17 was cold, and a cold winter is favourable to this moth. Warm winters are unfavourable, because the caterpillars remain near the surface of the ground, and are more liable to be affected by damp and pathogenic fungi.

Rape (*Brassica rapa*) suffered the most from this cutworm, and potatoes, which covered a larger area, nearly as much. The great injury to rape seems to be due to the fact that seedlings are planted out in stable manure recently ploughed under. If instead of planting seedlings seed is sown in drills, the danger will be less, because the manure will have been ploughed under some time before, and because the plants will be vigorous in July, the chief danger period. Potatoes are not a preferred food ; other root crops are more attractive. Both sugar and fodder beet suffered severely. In dry years young tobacco plants have been attacked. Winter cereals are not seriously infested. On light soils rye has been injured.

Rolling and harrowing are useful measures in the case of potatoes, and rape must be well hoed. The plough is only directly useful when ploughing manure, the important thing being to work the ground in autumn, at least in dry years. Stable manure should be applied in autumn or early spring, just before planting or sowing. In any case it must be ploughed under immediately, so as to prevent eggs being deposited.

E. segetum does not appear to be parasitised to any degree. Only about 1 per cent. were attacked. The Braconid concerned was not identified.

The use of artificial manures, such as kainit, seemed promising. If the manured ground is wet these substances appear to kill the caterpillars, though dry conditions prevent their action. Practical considerations, however, give little hope of this method being of use. In dry years the crops should be watched, and centres of infestation must be isolated by a steep-sided trench strewn with kainit. In wet years there is little to fear, especially after a warm winter.

BURKHARDT (F.) & VON LENGERKEN (H.). **Beiträge zur Biologie des Rapsglanzkäfers** (*Meligethes aeneus*, **Fabr.**). [Contributions to the Biology of *M. aeneus*.]—*Zeitschr. angew. Entom., Berlin*, vi, no. 2, February 1920, pp. 270–295, 32 figs. [Received 2nd December 1920.]

This paper contains a detailed account of the first part of the authors' investigations on *Meligethes aeneus*, F., the chief enemy of rape and turnip in Germany, and deals with the life-history and injury of the beetle from its first appearance in spring up to the emergence of the new generation, *i.e.*, from April to the end of June. The morphology and habits of *M. viridescens* are identical with those of *M. aeneus*. Investigations on *Ceuthorrhynchus napi*, Gyll., are still being carried on.

The larvae of *M. aeneus* do no damage, as they feed exclusively on pollen, without, however, injuring the infested flowers. They may cause self-pollination, or play an important rôle as pollen-carriers [*R.A.E.*, A, viii, 488, 542].

The adults appearing in spring may do great harm to the crops, much depending on the condition of the plants at the date of infestation. If the flowers are already open the beetles are able to feed at once on the pollen, but in a cold spring the buds are still closed when the beetles appear and serious injury may be done.

It is therefore necessary to select early flowering varieties in order that bud injury may be prevented. The attempts being made to raise such varieties are therefore calculated to solve the problem of combating this pest.

HEROLD (W.). **Zur Kenntnis von** *Agrotis segetum*, **Schiff. (Saateule). II. Die herangewachsene Raupe.** [A Contribution to the Knowledge of *Euxoa segetum*. II. The mature Caterpillar.]—*Zeitschr. angew. Entom., Berlin*, vi, no. 2, February 1920, pp. 302–329, 7 figs. [Received 2nd December 1920.]

This paper on the later larval stages of *Euxoa* (*Agrotis*) *segetum*, which are those chiefly injurious, supplements one already noticed [*R.A.E.*, A, viii, 271].

A combination of chemical and physical measures gives excellent results in combating the caterpillars. It was found that if infested fields are strewn with kainit the caterpillars will migrate and may be trapped in trenches. On a large-scale experiment, the application of kainit was followed by rain, and a mass migration was observed, very large numbers of the caterpillars being taken in the trenches. The mature larvae are unable to climb slopes of over 35°, and the sides of the trenches should be constructed at an angle of 45°, which effectually prevents escape and yet guarantees that the trench will maintain its shape. The trapped caterpillars should be collected each morning. In loose ground some may escape by burrowing, but by raking the bottom of the trench most of them can be recovered. At the bottom of a 12-inch-deep trench the caterpillars appear unable to burrow upwards to the surface, though they are known to be able to travel underground for over 3 ft. in a horizontal direction. This would explain why they are usually found near the surface, at a depth much exceeded by the roots of their food-plants, and why they hibernate at a depth of 4–6 inches only.

FULMEK (L.). **Zur Kenntnis der Raupe und Puppe von** *Bucculatrix thoracella,* **Thbg.** [A Contribution to the Knowledge of the Caterpillar and Pupa of *B. thoracella.*]—*Zeitschr. angew. Entom., Berlin,* vi, no. 2, February 1920, pp. 330–337, 11 figs. [Received 2nd December 1920.]

The larval and pupal stages of *Bucculatrix thoracella,* Thbg., are described. The cocoons, some of which were parasitised by Chalcids, were observed on lime-trees in Vienna.

ANDRES (A.) & MÜLLER (A.). **Ein einfaches Verfahren der Blausäureentwicklung aus Cyannatriumlösungen und seine Verwendung zur Bekämpfung schädlicher Insekten.** [A simple Process for generating Hydrocyanic Acid Gas from Solutions of Sodium Cyanide and its Use for combating injurious Insects.]—*Zeitschr. angew. Entom., Berlin,* vi, no. 2, February 1920, pp. 372–389. [Received 2nd December 1920.]

Hydrocyanic acid gas is generated when a solution of sodium cyanide is poured on the soil. No importance has hitherto been attached to this fact, which may be of value in combating insect pests. Warm, dry ground favours the generation of the gas. . The composition of the soil is an important factor, sand being less suitable, though the addition of ammonium sulphate will help the production of gas in this medium. Sodium cyanide is dangerous to plants if it comes in contact with their roots, but the decomposition product (soda) is harmless. It is therefore dangerous to adopt this method on ground in which plants are already growing, though no harm will result if the soil is treated some days prior to planting. In order to confine the gas, it is necessary to cover the ground, immediately after treatment, with some material such as newspaper, balloon silk, or packing paper, the edges of the covering being weighted. The ground must be kept covered for at least 45 minutes. Flea-beetles and Aphids may be killed in this manner. The ground must be dry and have a minimum temperature of 65° F. (18° C.). It is necessary to use $2\frac{1}{2}$ litres of a 5 per mille solution of sodium cyanide per square metre (about $4\frac{1}{2}$ pints per $10\frac{3}{4}$ sq. ft.). This strength does not injure either savoy or white cabbage if treatment is carried out in the evening. In hot-beds, pot-plants infested with Aphids and Coccids may be treated in the same manner.

HASE (A.). **Ueber die erste deutsche Forstentomologische Feldstation.** [Notes on the first German Field-station for Forest Entomology.] —*Zeitschr. angew. Entom., Berlin,* vi, no. 2, February 1920, pp. 390–400, 6 figs. [Received 2nd December 1920.]

Owing to the present financial conditions in Germany it is doubtful whether funds will be available for entomological field stations. Economic entomologists must attract public notice to the need for such stations and must endeavour to secure financial assistance from sources other than the State.

Owing to the action of the municipal authorities of the town of Guben, the first German field station, or rather, forest station, has been established in a forest of about 12,000 acres chiefly planted with pines, some of which are infested with *Dendrolimus* (*Gastropacha*) *pini.* Investigations are to be conducted on this moth and on methods for combating it.

FRICKHINGER (H.W.). **Die Kleidermotte** (*Tineola biselliella*, **Hummel) als Schädling in zoologischen Sammlungen.** [The Clothes Moth, *T. biselliella*, as a Pest of Zoological Collections.]—*Zeitschr. angew. Entom., Berlin*, vi, no. 2, February 1920, pp. 400–404, 5 figs. [Received 2nd December 1920.]

Many points in the life-history of the clothes moth, *Tineola biselliella*, Hum., remain unknown, and little information is available on its methods of spread.

Examination of an entomological collection infested by this pest led to the assumption, subsequently confirmed by breeding experiments, that *T. biselliella* is less a pest of the preserved insects than of the peat slabs at the bottom of the boxes.

ANDRES (A.). **Ein Schädling an Azaleen in Gewächshäusern.** [A Pest of Azaleas in Greenhouses.]—*Zeitschr. angew. Entom., Berlin*, vi, no. 2, February 1920, pp. 404–405. [Received 2nd December 1920.]

In the azalea house of the palm garden at Frankfort-on-Main some injury to the leaves is done by caterpillars of *Gracilaria zachrysa*, Meyr. (*azaleella*, Brants) [*R.A.E.*, A, iii, 463].

ANDRES (A.). **Starkes Auftreten des Schneeball-Blattkäfers** (*Galerucella viburni*, **Payk.**). [An Outbreak of the Viburnum Leaf-beetle, *G. viburni*.]—*Zeitschr. angew. Entom., Berlin*, vi, no. 2, February 1920, pp. 405–406, 2 figs. [Received 2nd December 1920.]

A severe infestation of *Viburnum opulus* by a Chrysomelid beetle, *Galerucella viburni*, Payk., is recorded from Hessen. The larvae enter the soil in June to pupate, and the adults emerge in August. Infested shoots should be removed in winter, or the ground beneath the plants should be disinfected in June or July.

ANDRES (A.). **Ueber den Messingkäfer** (*Niptus hololeucus*, **Fald.**). [Notes on *N. hololeucus*.]—*Zeitschr. angew. Entom., Berlin*, vi, no. 2, February 1920, pp. 406–407. [Received 2nd December 1920.]

In addition to larvae of *Endrosis lacteella* and *Ephestia elutella*, found in a sample of cocoa powder from a South German chocolate factory, both larvae and adults of *Niptus hololeucus*, Fald., were present. This beetle is known to feed on a variety of objects of animal or vegetable origin such as sponges, bones, feathers, brushes, woollen and leather goods, etc. It is a domestic pest in Europe, and difficult to combat. Fumigation with hydrocyanic acid gas (1 volume per cent.) kills it after several hours' exposure. According to Gulde it is attracted by damp cloths, so that it may be possible to trap it by means of these.

ANDRES (A.). **Der Zigarrenkäfer** (*Lasioderma serricorne*, **Fabr.**) **in getrocknetem Tabak.** [*L. serricorne* in dried Tobacco.]—*Zeitschr. angew. Entom., Berlin*, vi, no. 2, February 1920, pp. 407–408, 1 fig. [Received 2nd December 1920.]

The tobacco beetle, *Lasioderma serricorne*, F., is recorded in a consignment of tobacco from Holland. Fumigation with hydrocyanic acid gas was found effective. With a strength of 1 volume per cent., an exposure of 2 hours is required, or 24 hours at 1 volume per mille. Loose tobacco, cigars and cigarettes withstand 42 hours' exposure to $1\frac{1}{2}$ volumes per cent. without showing any trace of treatment or any loss of aroma.

v. LENGERKEN (H.). **Eine neue *Mordellistena* (Coleopt.) aus Columbien als Schädling an Orchideenkulturen.** [A new *Mordellistena* from Colombia as a Pest of cultivated Orchids.]—*Zeitschr. angew. Entom., Berlin,* vi, no. 2, February 1920, pp. 409–411. [Received 2nd December 1920.]

In February 1919 the leaves of *Cattleya labiata* in an orchid house in Berlin were severely injured by a new beetle that appears to have been imported with *Cattleya trianaei* from Colombia. The name *Mordellistena beyrodti* has been given to this species, a description of which is being published in the *Zoologische Jahrbücher* by W. Spengel. The egg is laid in the leaf, which becomes discoloured at the puncture, and the larva usually feeds between the leaf-veins. In May all larval stages may be found, often on one leaf, and pupae and adults about to emerge also occur.

Experiments with hydrocyanic acid gas showed that it is not suitable, as the plants suffer at strengths that do not affect the larvae. Fumigation with substances containing nicotine, however, appear to give good results against the adults.

OBERSTEIN (—). **Ueber ein Massenauftreten von Braconiden-Kokons in bodenständig-schlesischer Rotkleesaat.** [A Mass Occurrence of Braconid Cocoons in Silesian Red Clover Seed.]—*Zeitschr. angew. Entom., Berlin,* vi, no. 2, February 1920, pp. 411–412. [Received 2nd December 1920.]

The occurrence of large numbers of pupal envelopes of a Braconid is recorded from red clover seed of Silesian origin. Sorauer has pointed out that weevils belonging to the genus *Apion* are particularly apt to be attacked by such Hymenopterous parasites, and it is therefore advisable that seed-cleaning works should deal suitably with any large number of cocoons that may be noticed.

Die Deutsche Gesellschaft für Schädlingsbekämpfung. [The German Company for Combating Pests.]—*Zeitschr. angew. Entom., Berlin,* vi, no. 2, February 1920, pp. 413–414. [Received 2nd December 1920.]

The German Company for Combating Pests, Limited, is an undertaking established for the public welfare, and is controlled by the Imperial Government, which distributes the profits in furtherance of investigations on the combating of pests. The company is not directly concerned with entomology, technical chemistry, or applied botany, but carries out, commercially, the methods originated by entomologists, chemists, or botanists. It limits its activities to such business as requires commercial treatment. Fumigation with hydrocyanic acid gas is the principal method employed.

STELLWAAG (—). **Kellervergasung gegen die Korkmotte.** [Cellar Fumigation against the Cork Moth.]—*Zeitschr. angew. Entom., Berlin,* vi, no. 2, February 1920, p. 416. [Received 2nd December 1920.]

Fumigation with hydrocyanic acid gas has proved entirely successful against the cork moth, which in this instance had infested a cellar for several years.

ANDREWS (E. A.). **Insect Control.**—*Rept. Proc. 3rd Entom. Meeting, Pusa, February 1919, Calcutta*, i, 1920, pp. 23–32.

The necessity is emphasised of a thorough knowledge of the life-history of an insect, its relation to the plant attacked, and the response of the plant under cultivation to environmental conditions and to varying forms of existing agricultural practice, before the application of remedial measures. Instances of the success of cultural remedial measures against insects are discussed ; these include collar-pruning of tea to prevent attacks by termites, continued hoeing and forking against Melolonthid and other beetles, and improved drainage against *Tetranychus bioculatus*, W. M. (red spider). Sprays against the latter must contain something to break down the webs with which these mites protect themselves. Lime-sulphur containing much suspended matter is effective in this respect. Insecticides may prove successful against *Helopeltis theivora*, if applied when the bulk of the insects are in the young stages.

FLETCHER (T. B.). **Annotated List of Indian Crop Pests.**—*Rept. Proc. 3rd Entom. Meeting, Pusa, February 1919, Calcutta*, i, 1920, pp. 33–314, 6 plates.

It is not possible in an abstract to do more than notice this important list of Indian crop pests. It records over 1,100 species, and includes brief notes on their habits and food-plants as well as suggestions for remedial measures.

RAMAKRISHNA AYYAR (T. V.). **Some Insects recently noted as injurious in South India.**—*Rept. Proc. 3rd Entom. Meeting, Pusa, February 1919, Calcutta*, i, 1920, pp. 314–328, 12 plates.

This paper forms a supplement to Mr. Fletcher's book on South Indian insects [*R.A.E.*, A, iii, 146], and contains brief notes on some 112 species arranged under their natural orders.

ANSTEAD (R. D.). **Note on the more Important Insect Pests of Planting Districts of South India and the Methods of Control used, 1917–18.** —*Rept. Proc. 3rd Entom. Meeting, Pusa, February 1919, Calcutta*, i, 1920, pp. 328–332.

The pests dealt with are arranged under the crops attacked. On coffee, *Coccus viridis colemani* is distributed chiefly by the ants *Cremastogaster* sp. and *Plagiolepis longipes*. During the north-east monsoon these scales may be blown as far as 90 yards. The removal of ants and the spraying and brushing with fish-oil-resin soap at the rate of 1 lb. to 2 gals. water have proved efficient remedies. The fungi that infest them, *Cephalosporium lecanii* and *Empusa lecanii*, may be encouraged by distributing infected branches. *Saissetia hemisphaerica*, *Pulvinaria psidii* and other scales are controlled by periodical spraying. *Pseudococcus* (*Dactylopius*) *citri* occurs on coffee and *Erythrina lithosperma*. This scale and the cockchafer *Holotrichia conferta* may be destroyed by the use of "Apterite," a soil disinfectant apparently containing crude naphthaline and pink carbolic powder, applied at the rate of 2 cwt. per acre. Scrubbing the stems of coffee bushes in October and November with coconut husks proved an efficient remedy against *Xylotrechus quadripes* (coffee borer).

Tea pests include :—*Helopeltis*, against which the usual remedial measures were used ; *Thosea cervina*, controlled by collection of cocoons

and soil cultivation round affected bushes ; *Arbela* sp. ; *Aspidiotus camelliae*, controlled by fish-oil-resin spray ; *Contheyla rotunda* ; and *Terias silhetana*, a butterfly occurring on *Albizzia* and attacking the tea beneath.

Orange and lime trees have been attacked by *Chelidonium cinctum* at Bangalore. The eggs of this beetle are laid in the axils of young twigs in June. They hatch in about two weeks, and the young larvae bore into the twig first upwards and then downwards, making occasional small openings. They eventually bore into the main branches making tunnels about $\frac{1}{4}$ inch in diameter. The young twigs die at once, turning black so that they are easily seen, and they can be cut off with the larvae inside them. By doing this, and by catching the adults, the attack in question was to a large extent controlled.

SENIOR-WHITE (R.). **A List of Lepidoptera noted to attack cultivated Plants in Ceylon.**—*Rept. Proc. 3rd Entom. Meeting, Pusa, February 1919, Calcutta*, i, 1920, pp. 332–337.

This list of Lepidoptera includes over 100 species with their food-plants and parasites.

SENIOR-WHITE (R.). **A List of Plants, with their Lepidopterous Pests, in Ceylon.**—*Rept. Proc. 3rd Entom. Meeting, Pusa, February 1919, Calcutta*, i, 1920, pp. 337–341.

The contents of this paper are indicated by its title.

SHROFF (K. D.). **Lists of Insect Pests in Burma.**—*Rept. Proc. 3rd Entom. Meeting, Pusa, February 1919, Calcutta*, i, 1920, pp. 341–354, 1 plate.

These lists are arranged in tabular form, and give the name of the pest, the part of the plant attacked, and general remarks with regard to occurrence. The crops concerned comprise cereals, pulses, oil seed plants, tobacco, vegetables, sugar-cane, etc.

Nymphula sp. (paddy case-worm) attacks young rice plants. A method of collecting the caterpillar by means of a native fishing basket is described. *Ripersia sacchari* sometimes becomes a serious pest of rice, completely killing the tender plants. A stem-boring beetle has proved a serious pest of plantains. The eggs are probably laid on the stalks, and the larvae enter these and gradually bore down to the stem. A slimy exudation indicates their presence. Pupation occurs inside the stem.

FLETCHER (T. B.) & GHOSH (C. C.). **Borers in Sugar-cane, Rice, etc.**—*Rept. Proc, 3rd Entom. Meeting, Pusa, February 1919, Calcutta*, i, 1920, pp. 354–417, 47 plates.

As the borers of sugar-cane, rice, etc., have a wide range of food-plants included under the order Gramineae and even extending to the Cyperaceae, investigations were made with the object of tracing their occurrence in alternative food-plants. The inquiry, which has only been in progress for the last two years, and has been so far confined chiefly to the neighbourhood of Pusa, is far from being complete. As borers only found as yet in wild grasses may be potential pests of allied cultivated plants, they should be included in these inquiries. In the present paper the borers of 29 Gramineous and 2 Cyperaceous plants are recorded, but only those attacking sugar-cane and rice have been under systematic consideration. In order to obtain an approximate

idea of the amount of damage caused by the borers, other agents affecting the plants simultaneously have to be taken into consideration ; these include fungous diseases, which, besides being primary agents of damage themselves, generally follow borer attack ; termites ; *Gryllotalpa africana* (mole cricket) ; Melolonthid, Curculionid, Chrysomelid and Elaterid larvae ; and *Dorylus* sp. (red ants).

Over 30 species of borers are dealt with, and a classified list of them is given with keys to the larvae of the Lepidoptera concerned and to the pupae of *Raphimetopus* (*Anerastia*), *Diatraea* and *Chilo*. A list of borers arranged under the headings of the plants attacked is also given.

At the present stage of the investigations no practical effective remedial measures against the borers can be suggested. The presence or absence of alternative food-plants certainly affects the prevalence of Pyralid and Noctuid borers in any crop. The cutting out of " dead hearts " in sugar-cane and dry ears of rice is not advocated. Insects such as *Scirpophaga* spp. and *Diatraea* sp., that attack fully grown canes, may be checked by the removal of the affected stems, at least until a better method of dealing with them has been devised.

The natural enemies include Chalcid, Braconid and Ichneumonid parasites of practically all species of *Diatraea*, *Chilo* and *Scirpophaga* and Carabid grubs, *Chlaenius* sp., which have been occasionally observed preying on borer larvae, but the effect of the latter is apparently not very great. This important paper should be consulted in the original.

Misra (C. S.). **Some Indian Economic Aleyrodidae.**—*Rept. Proc. 3rd Entom. Meeting, Pusa, February 1919, Calcutta*, ii, 1920, pp. 418–433, 8 plates.

Aleurolobus barodensis, Mask. (sugar-cane white-fly), has been under observation for 14 years in various parts of the Central Provinces, the degree of infestation being variable. When ratoon cane is allowed to remain on the ground, the infestation on the new plantations is noticeably worse. In bad cases the whitish puparia on the leaves give the plants a white appearance, while the lower leaves are covered with a black fungus, *Capnodium* sp., associated with the honey-dew excreted by the insects.

This pest seems to prefer broad-leaved varieties of sugar-cane. Eggs are laid during the winter on the apices of unopened leaves or on old leaves full of nymphs and puparia. The clusters contain from about 3 to 50 eggs, the average being about 40. Nymphs, puparia and adults are seen during December, January and February. The adults are particularly active from August onwards, but are adversely affected by the hot winds of May and June. The stages are described. During August a complete life-cycle was observed to last 24 to 25 days ; in the winter it must occupy a much longer period.

No parasites of the eggs or adults have been observed, but the nymphs and pupae are heavily parasitised by three species of Chalcids, especially towards the end of the year. The most important of these is briefly described and figured. In 1907 the removal of infested leaves in the most affected plots was tried, and much good was done, but the method is rather drastic. No other easy and effective measure seems to be practicable.

Neomaskellia bergi, Sign., is a much less serious pest of sugar-cane, sometimes seen on the leaves with *A. barodensis* ; when numerous, the collection and destruction of egg-masses could be easily effected, as they are very conspicuous. All stages are devoured by *Scymnus* sp.

Aleurocanthus spiniferus, Quaint., is a pest of *Citrus* spp., having been observed at Pusa infesting orange, lemon and pomelo leaves. It does not appear to be injurious to the plants, except by encouraging the deposit of *Capnodium* sp. on the leaves. Nymphs and puparia are devoured by the grubs of *Chrysopa fulvolineata*, and are parasitised by a small Chalcid.

Misra (C. S.). **The Rice Leaf-hoppers.**—*Rept. Proc. 3rd Entom. Meeting, Pusa, February 1919, Calcutta*, ii, 1920, pp. 433–443, 1 plate.

The leafhoppers [*Nephotettix* spp.] infesting rice in various localities in India, and in particular in the Lushai Hills and a tract of country from Balasore in the east to the Raipur District in the Central Provinces in the west, are enumerated, with notes on their life-histories and habits [*R.A.E.*, A, viii, 472]. The preventive and remedial measures tried in 1915 [*R.A.E.*, A, iii, 528] are recommended.

Fletcher (T. B.) & Misra (C. S.). **Cotton Bollworms in India.**—*Rept. Proc. 3rd Entom. Meeting, Pusa, February 1919, Calcutta*, ii, 1920, pp. 443–472, 1 plate.

The conclusions that have been reached after many years' study of cotton bollworms in Pusa and elsewhere are recorded. Much of the information has been noticed in previous papers [*R.A.E.*, A, vii, 71–73, 132, 287, etc.]. The acreage of the various areas under cotton in India is given with the yield from each ; in all these the three chief species of bollworms are present. In the Punjab and Bombay, *Earias insulana* preponderates over *E. fabia*, which outnumbers the former in Bihar and Orissa, Bengal, Madras and the Central Provinces. At Pusa, *E. fabia* is the commoner species, *E. insulana* being found more in *Abutilon indicum* than in cotton. In the United Provinces *E. fabia* occurs also in greater numbers than *E. insulana*, though the greatest pest of cotton in these Provinces is *Platyedra* (*Gelechia*) *gossypiella*, which, moreover, is less susceptible to the attack of parasites than the others.

The life-histories of *E. fabia* and *E. insulana* have been worked out under Pusa conditions, that of *E. fabia* lasting from 21 to 32 days. The female moths fly after dusk and oviposit on the flowers, leaf-buds, tender top-leaves, capsules and flower-bracts of cotton. The young larvae bore into the buds, bolls or top-shoots. At Pusa both larvae and adults are present throughout the year, and there is no true hibernation, though activity is considerably restricted during the winter months. Oviposition usually begins with warmer temperature, winter vegetables being then replaced by bhindi (*Hibiscus esculentus*), which is the alternative food-plant. The tops of affected plants, if allowed to remain, soon send out fresh shoots, which again are attacked. In this way the growth is retarded, and the normal number of bolls is not produced. Such plants have a characteristic appearance, and should be pulled up and burnt. When the young plants are about a foot high, it is usual to thin them out ; if cultivators could be made to realise the necessity of pulling up at this time any that show signs of withering, much good would be done.

The two species of *Earias* are found at Pusa in cotton, *Hibiscus esculentus, H. abelmoschus, H. sabdariffa, H. panduriformis, H. rosa-sinensis, H. cannabinus, Abutilon indicum* and *Althaea rosea*. In

H. abelmoschus, E. cupreoviridis also occurs, but this moth has not been found in cotton.

The parasites of bollworms in India include two Braconids, two Ichneumonids and a Chalcid. Of these *Microbracon lefroyi* is the most important. The method of parasitism by this species is described. The complete life-cycle has been found to occupy from 9 to 13 days. Alternative hosts of this parasite are *Platyedra gossypiella, Epicephala chalybacma, Eublemma quadrilineata, E. amabilis, Adisura atkinsoni, Sylepta derogata, Phycita infusella, Anarsia melanoplecta, Chlumetia transversa, Alcides leopardus* and *Carpomyia vesuviana*. These were studied with a view to utilising them for breeding the parasite when required in various localities.

Very little success has as yet been obtained with light-traps, though *E. insulana* and *E. fabia* frequently come to lights, and *P. gossypiella* occasionally does so.

Tests have been made with thick and thin sowing, which have given no very decisive results, and also in growing cotton alone or inter-sown with tur (*Cajanus indicus*). In the latter case, the tur plants became so bushy that they interfered seriously with the growth and subsequent bolling of the cotton. Tables show the results of the various tests, as well as of trials to determine the relative immunity of different varieties of cotton to bollworm attack. The figures are, however, too inconclusive to do more than indicate the tendency of certain varieties to resist infestation.

In the discussion following this paper it was stated that a trap-crop would be the best remedy against bollworm attack, but that the chief difficulty is to induce cultivators to pull these up at the proper time, especially when the crop has been *H. esculentus*, which is a valuable vegetable, sometimes even more valuable than cotton. Topping the cotton is only practicable with a very vigorous crop, otherwise the destruction of the early shoots causes a severe check to the growth of the plant.

Gough (L. H.). **The Pink Bollworm in Egypt.**—*Rept. Proc. 3rd Entom. Meeting, Pusa, February 1919, Calcutta*, ii, 1920, pp. 472–532, 13 plates.

A review is given of the appearance and spread of *Platyedra gossypiella* (pink bollworm) in Egypt. The life-history, habits and food-plants are described [*R.A.E.*, A, iv, 277], and the effect of bollworm attack on the yield of cotton is discussed [*R.A.E.*, A, vii, 489]. The measures undertaken in Egypt for the control of the pest and the organisation for carrying them out are explained, and machines for the treatment of the seed are described and illustrated [*R.A.E.*, A, ii, 218, 319; iv, 472; vi, 42, etc.].

The campaigns of 1916 and 1917, as well as a general review of the situation, have recently been described by Ballou [*R.A.E.*, A, viii, 67, 222].

P. gossypiella is the cotton pest of outstanding importance in Egypt, *Earias* spp. no longer being regarded as serious pests, and the whole question of its control centres in the possibility of the early removal of growing cotton plants from the fields. A September campaign would give immeasurably better results than an October one, but unfortunately this is not yet possible from an agricultural point of view. The treatment of the seed is also an important measure, though far less so than field work. Much is hoped from the establishment of a

scientific cotton research board now being formed by the Government, to consist of Government officials of scientific standing with one or more representatives from outside. Its duties will be to promote research on all problems affecting cotton in Egypt, and without doubt that of the pink bollworm will be one of the most serious.

Tables are appended showing the quantities of Indian cotton imported into Egypt from 1903 to 1913, the distribution of pink bollworm attack in buds, flowers and green bolls, the dates of emergence of adults from pods and seeds of *Hibiscus esculentus,* the results of examination of pods of *H. esculentus* and *H. cannabinus,* the influence of position in which material containing pink bollworms is kept, the emergences of long-cycle moths, the results of light-trap experiments, and the infestation of green cotton bolls by the larvae, and comparing sound and attacked samples and the variations of the percentages of lint in various types of cotton in different years.

WILLCOCKS (F. C.). **Experiments in Egypt on the Survival of the Pink Bollworms (Resting Stage Larvae) in ripe damaged Cotton Bolls buried at different Depths.**—*Rept. Proc. 3rd Entom. Meeting, Pusa, February 1919, Calcutta,* ii, 1920, pp. 532–547.

Experiments with light-traps for catching adults of *Platyedra* (*Gelechia*) *gossypiella* are described, and the results shown in a series of tables. By means of 18 light-traps, used on two different plots, a total of 18,953 moths were caught in a little over 3 months. Of these, 10,141 were females, 5,959 males, and 2,853 remained unexamined. A large number of the females seemed to have been caught before oviposition commenced. Although females as a rule preponderated in the traps, at times the reverse was the case, and the reason for this fluctuation is not known. These results are not considered encouraging. As regards colour, the indications are that blue and white lights are the most attractive, green next, and red and orange least so. It is the author's opinion that the moths do not travel far to light, but only approach it when brought under its influence during their natural flight.

Many tests have also been made regarding the survival of resting pink bollworms in fallen bolls buried by ploughing the land for the crop following cotton. The results of these tests are tabulated. Their main object was to obtain confirmation of the survival of pink bollworms in bolls buried to a depth of 2 to 4 inches, after the removal of the restrictions on the irrigation of land that has grown bersîm [*Trifolium alexandrinum*], beans, wheat or barley and has been left fallow after the cotton crop. This evidence was obtained, as there were living bollworms present at that depth at the end of July. It is considered that these infested, buried bolls constitute a source from which the growing cotton crop might be infested; given only a small percentage of survivals to the end of June, when conditions are very favourable, multiplication in the cotton fields would be rapid. The survival of buried bollworms was found to be greatest under wheat and bare fallow, and least under bersîm. The influence of moisture on the activity of bollworms is probably great, high temperatures in particular inducing the larvae to leave the bolls or seeds and pupate. The small number of larvae in bolls buried at a depth of from 6 to 8 inches is probably accounted for by the much moister conditions, causing the larvae to leave these bolls more readily than those under the drier surroundings prevailing at depths of 2 to 4 inches.

Misra (C. S.). **Some Pests of Cotton in North Bihar.**—*Rept. Proc. 3rd Entom. Meeting, Pusa, February 1919, Calcutta,* ii, 1920, pp. 547–561, 5 plates.

The cotton pests of North Bihar were first studied in 1906, when *Earias fabia, E. insulana* and *Platyedra gossypiella* were doing so much damage in the Punjab and the North-West Frontier Province. Cotton plants were at that time attacked by *Chrotogonus* spp. (grasshoppers), caterpillars of *Sylepta derogata, Alcides leopardus* (shoot-weevil) and *Pempheres affinis* (stem-weevil). *Empoasca notata* (leaf-hopper) also caused the leaves to drop, while *Dysdercus cingulatus* (red cotton bug) and *Oxycarenus laetus* (dusky cotton bug) spoiled any lint that was left by the bollworms. Under these conditions the growing of cotton could not be profitable, but its cultivation was continued for the purpose of breeding parasites of the bollworms for distribution to other districts. This cultivation has continued for about 14 years, during which time operations have been considerably hampered by the presence of *Pseudococcus corymbatus,* Green, *P. virgatus,* Ckll., *Phenacoccus hirsutus,* Green, *Saissetia nigra,* Nietn., a Cercopid *Machaerota planitiae,* and *Eriophyes* sp. (possibly *E. gossypii*). The mealy-bugs are particularly troublesome, probably owing to the practice of allowing the cotton crop to remain on the ground throughout the year for the purpose of investigation of bollworm parasites. *P. corymbatus* and *Phenacoccus hirsutus* are the worst ; both appear at the same time on the top shoots, together with *P. virgatus.* A key is given to distinguish these three scales, and their habits are discussed. The effect of their attacks is to render the top shoots hard and compact, considerably retarding the growth of the plant. Three species of Chalcids attack them, and larvae of *Scymnus nubilans* and a Cecidomyid, *Diadiplosis indica,* are predaceous on them. The caterpillars of *Eublemma quadrilineata* have also been observed to clear whole colonies of mealy-bugs from the shoots, but their appearance is very spasmodic and they cannot be relied upon. It is possible that numbers of the Drosophilid, *Gitonides perspicax,* Knab, and also Anthocorid nymphs may be predaceous on them.

Machaerota planitiae is particularly bad from April to December, the nymph exuding a clear liquid until it is surrounded by a froth which coagulates, forming a tube in which it remains until the adult emerges. No parasites or predators of the eggs, nymphs or adults have been found. In 1912 the life-cycle was found to last 40 to 41 days. The mite, *Eriophyes* sp., considerably retards growth when the attack is severe, and occasionally has been responsible for the loss of 50 per cent. of the crop.

Shroff (K. D.). **List of the Pests of Fibre-yielding Plants in Burma.**—*Rept. Proc. 3rd Entom. Meeting, Pusa, February 1919, Calcutta,* ii, 1920, pp. 562–563.

This list enumerates the pests of cotton, hemp and jute in Burma, and gives details of the part of the plant attacked and the economic importance of each species.

Misra (C. S.). **Index to Indian Fruit Pests.**—*Rept. Proc. 3rd Entom. Meeting, Pusa, February, 1919, Calcutta,* ii, 1920, pp. 564–595.

The purpose of this paper is indicated by its title. Brief notes are given on the distribution of each species and the nature of the damage caused to the crops, which are dealt with in alphabetical order.

SHROFF (K. D.). **List of the Pests of Fruit-trees (including Palms) in Burma.**—*Rept. Proc. 3rd Entom. Meeting, Pusa, February 1919, Calcutta,* ii, 1920, pp. 596–600.

This list is accompanied by remarks indicating the status of the pests enumerated.

RAMAKRISHNA AYYAR (T. V.). **Coccids affecting Fruit-trees in Southern India.**—*Rept. Proc. 3rd Entom. Meeting, Pusa, February 1919, Calcutta,* ii, 1920, pp. 601–609.

The recent rapid extension of the area under fruit in India has encouraged the dissemination of various Coccids, which, although only in a few instances causing very serious losses at the present time, are yet potential pests of importance. Those here recorded include 61 species, for which the localities and extent of the damage done are indicated. [cf. *R.A.E.*, A, vii, 402; viii, 146].

MISRA (C. S.). **Tukra Disease of Mulberry.**—*Rept. Proc. 3rd Entom. Meeting, Pusa, February 1919, Calcutta,* ii, 1920, pp. 610–618, 1 plate.

The disease of mulberry trees known locally as "tukra," and by various other native names denoting malformation of the leaves and shoots, is caused by the mealy-bug, *Phenacoccus hirsutus,* Green, and not by *Dactylopius bromeliae* as was hitherto thought. The author has observed the disease at Pusa, and in the silk-growing districts of Bengal, Murshidabad, Malda and Bankura, and it may occur in other localities. The shoots of plants infested with the nymphs of *P. hirsutus* first turn coppery-green, then pale yellow, and ultimately become so hard and compact that they cannot be opened without breaking away the crisp leaves. Such leaves, if used to feed silkworms (*Bombyx mori*), cause flacherie and grasserie among them. During the winter the mature females of *P. hirsutus* descend the stems and hide in leaf-scars, under crevices in the stem, etc. At Pusa, this mealy-bug has been found on *Morus* spp. and cotton and on *Ficus religiosa* in pots. *Pseudococcus virgatus,* Ckll., often accompanies it, but does not cause malformation of the leaves. The life-history and habits of *P. hirsutus* are described. In addition to the parasites and predators recorded for this species in a previous paper [*R.A.E.*, A, ix, 74] the caterpillars of the butterfly *Spalgius epius* sometimes destroy whole colonies of this mealy-bug.

RAMAKRISHNA AYYAR (T. V.). **A Note on our Present Knowledge of Indian Thysanoptera and their Economic Importance.**—*Rept. Proc. 3rd Entom. Meeting, Pusa, February 1919, Calcutta,* ii, 1920, pp. 618–622.

The species of thrips recorded in India up to the present time are enumerated. The most injurious of these are *Thrips oryzae* on young paddy; two species of *Thrips* (*Physothrips*) on tea, as well as *Panchaetothrips indicus,* Bagn. (turmeric thrips); *Heliothrips indicus,* on onions; and *Rhipiphorothrips cruentatum* (grape-vine thrips), which greatly injures the tender foliage of grapes.

A species causing curling of young pepper leaves is probably *Gynaikothrips karnyi,* Bagn., known as a pest of pepper in Ceylon. There is very little literature on the Indian species of thrips, and the subject is well worth further study.

Dutt (H. L.). **The Methods of Control of** *Agrotis ypsilon* **in Bihar.**—*Rept. Proc. 3rd Entom. Meeting, Pusa, February 1919, Calcutta,* ii, 1920, pp. 622–625.

In view of the habits of *Agrotis ypsilon*, the ploughing of the land four or five times before sowing should largely reduce the number of caterpillars. In the chaur land of India, however, this method of cultivation is impossible, the soil being composed of stiff, heavy clay on which cultivation is only practicable for 15 to 20 days after the flood water has left the land. A common method of cultivation in the lower chaur land is broadcasting, *i.e.*, scattering the seed on the land immediately after the water has left it. The crop on an area so treated is always better than that on a ploughed area, probably because the surface of the ground is smoother and affords less shelter to the caterpillars. Broadcasted areas do not, however, produce as large a crop as ploughed areas, and therefore the method cannot be generally adopted. Rotation of crops is also useless as a remedy, since all crops grown on chaur land are attacked by these cutworms. Poison-baits are impracticable owing to the enormous extent of the area. Experience during the last eight years has shown that the most satisfactory method of control is the use of Andres–Maire traps [*R.A.E.*, A, i, 507; iii, 320; v, 365] against the adults, supplemented by handpicking the larvae of the first generation on higher land. The results obtained by the use of these traps since 1911 are recorded. The destruction of weeds does not reduce the numbers, as the caterpillars migrate to other food-plants, such as tobacco.

With a view to studying the possibility of control by natural parasites, the life-history of a Braconid has been worked out. The period from oviposition to adult lasts 36 days in January and February, and 25 days in March. In April the egg and larval stages occupy 12 days only. The larva aestivates in March or April; it is not yet known when it emerges as an adult, but this presumably occurs when the caterpillars of the first generation are appearing in September or October. At that time the percentage of parasitism is very low. A large number of parasites, of which there are several, including Braconids and Tachinids, were therefore reared in the insectary in February and March 1917 and 1918 and allowed to go into aestivation in April. In both instances they failed to emerge or even to pupate. It is evident that the natural factors controlling their emergence from the aestivating pupae did not prevail in the insectary. Attempts will be made to determine what these factors are, and to find out whether the caterpillars found in the hills during the rains are parasitised there, and if so, whether the parasites concerned could be bred out for use in the chaur lands.

Fullaway (D. T.). **Control of the Melon-fly in Hawaii by a Parasite introduced from India.**—*Rept. Proc. 3rd Entom. Meeting, Pusa, February 1919, Calcutta,* ii, 1920, pp. 625–629.

An account is given of the author's journey in southern India and elsewhere in search of parasites of the melon fly, *Dacus* (*Chaetodacus*) *cucurbitae* [*R.A.E.*, A, v, 2, etc.]. At the present time, the Indian parasite, *Opius fletcheri*, destroys 50 per cent. of the melon-flies infesting fruit in Hawaii.

SHIRAKI (T.). **Insect Pests of the Tea-plant in Formosa. (Preliminary Report.)**—*Rept. Proc. 3rd Entom. Meeting, Pusa, February 1919, Calcutta,* ii, 1920, pp. 629–669.

The insect pests of tea in Formosa have not as yet received full investigation. The species enumerated, with brief notes on the life-history and habits, and in some cases suggestions for remedial measures, include :—*Odontotermes formosanus,* Shir., *Leucotermes speratus,* Kolbe, *Toxoptera citrifolia,* Maki, *Ceroplastes ceriferus,* Anders., *C. floridensis,* Comst., *C. rubens,* Mask., *Saissetia* (*Lecanium*) *hemisphaerica,* Targ., *Chionaspis theae,* Mask., *Icerya aegyptiaca,* Dougl., *I. seychellarum,* Westw. (*okadae,* Kuw.), *I. purchasi,* Mask., *Empoasca flavescens,* F., *Tettigonia ferruginea* var. *apicalis,* Wlk., *Geisha distinctissima,* Wlk., *Brachytrypes portentosus,* Licht., *Olegores citrinella,* Shir., *Acria gossypiella,* Shir., *Lecithocera formosana,* Shir., *Homona menciana,* Wlk., *Adoxophyes fasciata,* Wlsm. (*Archips minor,* Shir.), *Clania variegata,* Cram., *C. destructor,* Dudg., *Mahasena* sp., *Diabasis* (?) sp., *Zeuzera coffeae,* Nietn., *Euproctis conspersa,* Butl., *E. varians,* Wlk., *Porthesia montis,* Leech, *Notolophus* (*Orgyia*) *posticus,* Wlk., *Dasychira mendosa,* Hb., *D. dudgeoni,* Swinh., *Redoa cyanea,* Mo., *Thosea sinensis,* Wlk., *T. castanea,* Wilem., *Orthocraspeda trima,* Mo. (*Thoseoides fasciata,* Shir.), *Canea bilinea,* Wlk., *Nagoda nigricans,* Mo., *Narosa nitobei,* Shir., *Amata perixanthia,* Hmp., *Biston marginata,* Mats., *Heterusia oedia,* Lism., *Tiracola plagiata,* Wlk., *Andraca bipunctata,* Wlk., *Hypomeces squamosus,* F., *Aeolesthes induta,* Newm., *Oscinis theae,* Lef., and *Tetranychus bioculatus,* W. M.

ANDREWS (E. A.). *Helopeltis theivora,* **Waterh.**—*Rept. Proc. 3rd Entom. Meeting, Pusa, February 1919, Calcutta,* ii, 1920, pp. 669–671.

Investigations are described into the effect of soil conditions on the incidence of *Helopeltis theivora* (mosquito blight of tea) [*R.A.E.,* A, viii, 204].

RAMACHANDRA RAO (Y.). **Lantana Insects in India.**—*Rept. Proc. 3rd Entom. Meeting, Pusa, February 1919, Calcutta,* ii, 1920, pp. 671–680.

The information contained in this paper has been noticed from another source [*R.A.E.,* A, viii, 473].

BEESON (C. F. C.). **Some Problems in Forest Insect Control.**—*Rept. Proc. 3rd Entom. Meeting, Pusa, February 1919, Calcutta,* ii, 1920, pp. 696–704.

Accounts are given of some of the pests of outstanding importance in Indian forestry, much of the information having been previously noticed [*R.A.E.,* A, iii, 729 ; vi, 521 ; vii, 135, 367 ; viii, 164, etc.].

A study of these pests indicates three classes of problems to be dealt with, *viz.,* the control of pests of intensive cultivation, which much resembles agricultural entomological problems ; the reduction of damage by insects to the standing crop, where the damage is greater than that from other more easily controllable factors ; and the prevention of pests likely to arise from new methods of forest management, and particularly the creation of uniform forests and pure plantations. A difficulty in dealing with the last two classes of problems is the scale on which an inquiry has to be carried out, both in space and time.

Fletcher (T. B.) & Ghosh (C. C.). **The Preservation of Wood against Termites.**—*Rept. Proc. 3rd Entom. Meeting, Pusa, February 1919, Calcutta*, ii, 1920, pp. 705–712.

The results of the treatment of wood with various substances as a preventive against attack by termites are shown in a series of tables, several different kinds of timber being used in the experiments. The various processes are placed in the order of their efficiency as follows :—hot creosote, more than 81 months efficiency ; cold creosote, less than 28 months ; carbolineum, 23 months ; Powell process, 21 months ; lead arsenate, 16 months ; mortant, 15 months ; sideroleum, 14 months ; microlineum, 14 months ; solignum, 12 months ; zinc chloride, 12 months ; timborite, 11 months ; lead chromate, 7 months ; siderosthen, 4 months.

Attention is called to the fact that treatment is of little use unless the whole surface subject to attack is treated, and that if wood is cut after treatment, the exposed surface is especially liable to attack.

Fletcher (T. B.) & Ghosh (C. C.). **Stored Grain Pests.**—*Rept. Proc. 3rd Entom. Meeting, Pusa, February 1919, Calcutta*, ii, 1920, pp. 712–761, 25 plates.

The list of granary pests in India, in addition to those recorded for the Punjab [*R.A.E.*, A, v, 126–128] include :—In cereals, the Coleoptera, *Trogoderma khapra* [*R.A.E.*, A, v, 359], *Tenebroides mauritanicus*, *Attagenus piceus* and *Gibbium scotias* ; in pulses, *Bruchus chinensis* and other Bruchids, and *T. khapra* ; in spices, *Lasioderma serricorne*, and *Anobium* sp. ; and the general storage pests, *Alphitobius piceus*, *Ephestia cautella*, *Pyralis pictalis* and *P. farinalis*.

Details of the life-history and habits of the more important of these pests, as occurring under Pusa conditions, are described. There has been some difference of opinion as to the status of *T. mauritanicus*. These beetles are predaceous upon *Calandra oryzae*, but they also attack the grain, upon which the grubs live entirely, and must therefore be regarded as noxious. The rate of development is, however, too slow to render them a serious pest. *Gibbium scotias* has not previously been recorded as a grain pest, but in stored wheat is found to complete a generation in one month. Small, white eggs are laid among the grain on which both grubs and adults feed. This beetle has also been found boring into opium cakes and damaging papers. It is a household insect, and may prove to be serious, as its multiplication is rapid. *Attagenus piceus* is also recorded for the first time as a pest of stored grain, but is not of much importance.

Lists are given of grains, etc., commonly stored in houses, that are immune to attacks of these granary pests and of those that are affected by them.

A number of storage receptacles in use among the natives are described and photographed. Eighteen storage experiments with wheat, husked rice and pulses are described and the results discussed. The results to be aimed at in successful storage of grain are that it should not be damaged by insects, that it should not lose its germinating power when required for use as seed, and that it should not deteriorate in quality. The various types of earthern vessels, mud-bins and bamboo-bins used in the native households cannot be made insect-proof. There is no treatment known that can immunise the grain against insects even for a few months. The safest method is to store

grain in open-mouthed receptacles and to cover it at the top with a layer of fine, dry sand [*R.A.E.*, A, viii. 65]. Illustrations show how various types of receptacles can be adapted to this method.

KUNHI KANNAN (K.). **Mercury as an Insecticide (Abstract).**—*Rept. Proc. 3rd Entom. Meeting, Pusa, February 1919, Calcutta*, ii, 1920, pp. 761–762.

The practice of placing a drop of mercury in the receptacle used for storing pulse crops obtained for many years among the natives of Mysore, though recently it has almost died out. Though this has been regarded rather as a superstition than as a practical remedy, experiments have shown the value of the practice, as it prevents the multiplication of the beetles infesting the grain, particularly in small vessels of a few cubic feet capacity. The action is evidently on the eggs, and the process is found to have the same effect on the eggs of silkworms. It is thought that the subject should have further investigation.

SHROFF (K. D.). **List of the Pests of the Stored Products, Spices and Drugs, in Burma.**—*Rept. Proc. 3rd Entom. Meeting, Pusa, February 1919, Calcutta*, ii, 1920, pp. 762–763.

The contents of this paper are indicated by its title.

KASERGODE (R. S.). **Potato Preservation in the Bombay Presidency.**—*Rept. Proc. 3rd Entom. Meeting, Pusa, February 1919, Calcutta*, ii, 1920, pp. 763–770.

Potatoes are an important crop in India, and they require to be preserved from one harvest to another, both for seed purposes and for consumption. Under existing conditions they are stored in pits dug in the ground, generally under a tree, and covered with a roof of straw and leaves. When dug up, they are very heavily infested with the potato moth [*Phthorimaea operculella*], as well as being attacked by perhaps as many as five different kinds of rot. In the case of infested potatoes, fumigation with carbon bisulphide kills the larvae and pupae, but has no action on the eggs unless they are exposed to the fumes for 48 hours or more. If the tubers are fumigated before the first generation of moths has oviposited, breeding will not take place in them. Petrol can be substituted, using one pint to every cubic foot of space and exposing for 24 hours ; the larvae and 90 per cent. of the pupae are killed in this way. The potatoes should not be fumigated for at least two weeks after harvesting, to avoid injury to the skins by handling. Thorough selection before storage and ventilation of the storehouse will also help to preserve them both from infestation and from rot.

GHOSH (C. C.). **Bee-keeping in India.**—*Rept. Proc. 3rd Entom. Meeting, Pusa, February 1919, Calcutta*, ii, 1920, pp. 770–782, 1 plate.

Bee-keeping in India should, with improved methods, become a very profitable industry. An immediate improvement could be effected by the introduction of proper methods of extracting the honey from the wild combs. At present the honey produced in India is not marketable, and is consumed locally where produced, as it will not keep. A further necessary innovation would be the introduction of Italian

colonies, as the form of Indian bee that can be domesticated is a poor honey-gatherer, is extremely prone to swarming, and is unable to protect its hive against the wax moth [*Galleria mellonella*]. This point was discussed by the meeting and a resolution was unanimously carried to the effect that the importation of bees, beeswax or honey from countries infected with bee-diseases was considered so dangerous that it should only be permitted under necessary restrictions.

MISRA (C. S.). **Lac-culture in India.**—*Rept. Proc. 3rd Entom. Meeting, Pusa, February 1919, Calcutta,* ii, 920, pp. 782–800, 2 plates.

Much of the information contained in this paper has been previously noticed [*R.A.E.*, A, vi, 513]. The present situation with regard to lac-culture in various regions of India is described, and the possibility of cultivating the insect and carrying on the industry on scientific and business lines is discussed. With the establishment of nurseries for the distribution of healthy brood-lac and improvements in the methods of collection, the question of parasites and predators has to be considered. *Eublemma amabilis* is the worst known enemy of lac on the trees, the caterpillars devouring the females and pupating within silken galleries made in the incrustations. In some localities this moth renders lac cultivation impossible. The question of Chalcid parasites will also have to be studied in greater detail, and the rôle of *Holcocera pulverea* must be determined as regards lac on trees as well as stick-lac in storage. Lac cultivation is a very old and important industry in India, and that country practically holds the monopoly as yet; it is considered that the time has come when steps should be taken to safeguard and resuscitate its interests.

DE (M. N.). **The Pusa Experiments on the Improvement of Mulberry Silkworms.**—*Rept. Proc. 3rd Entom. Meeting, Pusa, February 1919, Calcutta,* ii, 1920, pp. 800–808, 1 plate.

The silk industry in India is showing signs of revival, both as regards value and quantity, but it is generally admitted that the multivoltine races of India have degenerated, while European races have been improved. The suitability of various hybrid races is discussed, and a table shows the results of rearing various races of silkworms of different countries, from which an idea of the yield of silk of each race can be obtained. The method of examining moths for pebrine disease is described, and the future possibilities of the industry are briefly touched upon.

DE (M. N.). **The best Method of eliminating Pebrine from the Multivoltine Silkworm Races of India.**—*Rept. Proc. 3rd Entom. Meeting, Pusa, February 1919, Calcutta,* ii, 1920, pp. 809–835, 1 plate.

The elimination of pebrine disease of silkworms, which is discussed in this paper, is of the utmost importance to the silk industry of India. It is pointed out, however, that the Pasteur method, as practised in France for the last 50 years, has only succeeded as yet in keeping the disease in check. At present the origin of the disease and its other possible hosts are not fully understood. It is hoped that in the future new methods of detecting the disease, backed by legislation, may enable it to be successfully combated.

PATTERSON (W. H.). **Report of the Entomologist.**—*Gold Coast: Rept. Agric. Dept. 1919, Accra,* 1920, pp. 17–20. [Received 20th December 1920.]

Cacao pests were particularly troublesome in 1919, owing partly to their remaining undisturbed for long periods during the war and also to the abnormally dry season and the unusual distribution of rain during the year. Important pests include the two bark-sappers, *Sahlbergella singularis,* Hagl., and *S. theobromae,* Dist. These suck the bark chiefly of the woody shoots, preference being given to trees in rapid growth from 2 to 5 years old. The food consists solely of the branches and pods, the tissue of the shoot in the vicinity of each puncture being killed down into the wood. During periods of dry weather the attacked branches quickly wither and die. The only remedies possible are spraying and hand-collection of the bugs, but neither of these is very practicable, as each insect must be covered by the spray and hand-picking is considered too tedious. The finding of *S. singularis* on *Berrya ammonilla,* introduced from India, strengthens the view that its food-plants are confined to Malvaceae and allied orders; the only previous food records are *Eriodendron anfractuosum* and *Gossypium* sp. *Helopeltis bergrothi,* Reut. (cacao mosquito) works in a similar manner, but limits its attacks to soft green shoots and pods of all ages. All the soft shoots may be continually killed, giving rise to die-back disease. When very young pods are attacked they die, and thus the yield is materially lessened, but older pods when punctured do not suffer much. *Heliothrips rubrocinctus,* Giard (cacao thrips) caused serious damage by feeding on the leaves and pods. The leaves fell continually, so that a number of flushes of new foliage were produced at the expense of the trees' vitality, and attacked pods failed to change colour when ripe, and thus were either picked before maturity or allowed to become over-developed.

Coconuts are still badly infested with *Archon centaurus,* Burm. (rhinoceros beetle) [*R.A.E.*, A, viii, 9], and attention is drawn to the necessity of co-operation in remedial measures and of clean sanitation about houses and plantations, and to the advisability of passing legislation to enforce action against this pest and of introducing parasites of the larvae. *Rhynchophorus phoenicis,* F. (palm weevil) was occasionally found attacking palms where fresh green leaves had been removed, the wounds attracting the females for oviposition. *Aspidiotus destructor* (coconut leaf scale) caused some yellowing of the foliage owing to the decreased rainfall.

The Hispid beetle, *Coelaenomenodera elaeidis,* Maul., defoliated thousands of oil palms, which produced smaller bunches and individual fruits with a thinner pericarp, and therefore less oil. The beetle seems to be unchecked by parasites, and remedial measures are impracticable [*loc. cit.*]. It is hoped that the succeeding rains will be more normal in character, and that the unknown factors that exterminated this pest in the Eastern Province during the rainy season of 1910 may reappear. The weevil, *Balanogastris colae,* has been less injurious on kola owing to the care with which the few fallen fruits that have matured out of season, and in which the insects breed, have been promptly removed. The essential point in the control of this pest is the maintenance of a rigid close season. Losses to maize caused by the maize stalk-borer, *Sesamia* sp., could be largely prevented if planters promptly destroyed all young infested plants and all old stems as soon as the first crop was harvested.

Fruit moths caused little damage in 1919, though this is contrary to the experience of 1920. A few individuals of *Othreis* (*Ophideres*) *fullonica* were observed towards the end of 1919, and *Achaea obvia* appeared in swarms from mid-March and attacked all maturing fruit. No study has yet been made of the bionomics of these pests, and their food-plants are not yet known. They are stated to migrate to higher elevations with the advent of the dry season.

Cotton grown from seed imported from Jamaica was severely attacked by a leaf-blister mite, possibly *Eriophyes gossypii*, Banks.

Byars (L. P.). **The Nematode Disease of Wheat caused by** *Tylenchus tritici*.—*U.S. Dept. Agric., Washington, D.C.*, Bull. 842, 7th September 1920, 40 pp., 6 plates, 6 figs. [Received 21st December 1920.]

The bulk of this information dealing with the Nematode, *Tylenchus tritici*, Steinb., its distribution, spread and control has been noticed elsewhere [*R.A.E.*, A, vii, 324, 380]. Although primarily a parasite of wheat, this pest may apparently also attack rye, oats, emmer [*Triticum*] and barley.

As a result of experiments to ascertain the effect of various chemicals on this Nematode, it is evident that it is strikingly resistant to their action, and that substances not injurious to wheat fail to kill the larvae. The Nematodes may, however, be destroyed by submersion in water for 10 minutes at a temperature of 51° to 52° C. [124°–126° F.], but if the galls are not first removed the temperature should be raised to 54° or 56° C. [129°–133° F.], and the wheat submerged for 10 to 12 minutes.

Back (E. A.). **Insect Control in Flour Mills.**—*U.S. Dept. Agric., Washington, D.C.*, Bull. 872, 11th November 1920, 40 pp., 15 figs.

Insect pests in flour and cereal mills are responsible for great losses, but the obvious advantages of preventive measures and the modern improvements in mill construction are gradually bringing about a decrease in them. The insect that most seriously affects milling operations is *Ephestia kühniella* (Mediterranean flour moth), which is now established in almost every mill in America and, owing to the webbing habit of the larvae, sometimes completely stops the machinery. Under ordinary conditions in flour mills about nine weeks are required to complete the life-cycle, though this varies greatly with the temperature. Below 55° F. activity is suspended. The usual method of entry into mills is in sacks that have been used before, or when second-hand machinery that has not been properly fumigated is installed. Mills in any infested centre are liable to infestation in spite of all precautions, as the moths can fly from building to building. The need for cleanliness cannot, however, be over-emphasised. The insects prefer to oviposit and develop in flour and cereals lying in undisturbed, darkened situations. The proper construction of a good type of mill, the liberal use of air-slaked lime, and the care of sacks and bags are discussed.

Some check on the numbers of *E. kühniella* is exercised by the parasites, *Habrobracon hebetor*, Say, and *Omorga frumentaria*, Rond., but these can only be considered an accessory factor in control. The two artificial remedies that have proved of the greatest value are fumigation with hydrocyanic acid and super-heating. The fumigation method is described, and all directions for the process are explained. While this is effective against *E. kühniella*, it is not so satisfactory against some of the stages of *Tribolium confusum*, Duv., and *T.*

castaneum, Hbst. (*ferrugineum*, F.) (flour beetles), *Laemophloeus minutus*, Ol. (bran beetle), *Tenebroides mauritanicus*, L. (cadelle) and *Silvanus surinamensis*, L. (saw-toothed grain beetle). These beetles are naturally more resistant to the effect of gas, as they secrete themselves in the cracks and crevices of wooden elevators, etc., where they are inaccessible to it. For these the most practical remedy is the application of a high temperature, which at the same time destroys all other mill-infesting insects. Heat should be applied in the summer, a temperature of 118° to 125° F. in all parts of the mill being necessary to kill all pests. A pressure of 25 to 50 lb. steam heat is recommended for the purpose. Directions for carrying out this process are given. It is estimated that in mills of moderate size the heat method saves sufficient to pay in five years for the cost of its installation. Neither this nor the fumigation method injures the building or plant or affects the baking qualities of flour.

Entomology.—*45th Ann. Rept. Ontario Agric. Coll. & Exp. Farm, 1919, Toronto,* 1920, pp. 31–34. [Received 21st December 1920.]

The transformation from winter to summer conditions in Ontario in 1919 was unusually rapid, and insects appeared in large numbers with startling suddenness. Aphids were very destructive to many crops. *Heliothis obsoleta* (corn ear worm) caused much loss to maize growers in south-western Ontario. This is a difficult pest to deal with, and the only practicable remedy is to plough the infested fields as late as possible in the autumn in order to expose the pupae to the cold. Any ears found to be infested should be cut off and used as pig food. In Ontario, *H. obsoleta* also occasionally attacks tomato fruits and the buds of tobacco. *Alabama argillacea* (cotton moth) was observed in several localities in September, having migrated northward from the cotton fields over a thousand miles away. It did not, however, do any damage. Weevils in stored grain are increasing in number and destructiveness. Only perfectly clean receptacles should be used for storing grain, and no refuse should be allowed to accumulate in the store-houses ; frequent examination of bins and bags should be made, and no grain should be left undisturbed for more than a year.

The usual infestations of fruit pests occurred, none of them being of outstanding importance. Of vegetable pests, *Phorbia* (*Chortophila*) *brassicae* (cabbage maggot) has been the subject of many tests, and of the various substances tried, corrosive sublimate gave the best results. In the case of radishes after two treatments 90 per cent. were free from infestation, and they were also larger and of better quality. For *Pieris rapae* dusting with calcium arsenate and hydrated lime, and spraying with tobacco extract, both proved disappointing. Treatments that proved satisfactory were pyrethrum powder 1 oz. to 2 gals. of water, sprayed directly into the heads of the plants ; or a dry mixture of about 1 oz. of Paris green to 1 gal. of middlings. This last remedy is applied by taking a small quantity and scattering it between the fingers where the caterpillars are feeding in the heads of cabbages. This method would not be safe on cauliflowers. For *Thrips tabaci* (onion thrips) 1 part of Blackleaf 40 to 400 parts of water, with 1 oz. of common soap to 2 gals. of the liquid, was found effective.

Pests of bush fruits that received attention during the year included *Pteronus ribesii* (currant sawfly), which confined its attacks to red and white currants and gooseberries ; *Aegeria* (*Sesia*) *tipuliformis* (imported currant borer) ; and *Metallus bethunei* (blackberry leaf-miner), which is becoming increasingly abundant in many districts.

Mally (C. W.). **Some Zoological Factors in the Economic Development of South Africa.**—*S. African Jl. Sci., Johannesburg,* xvii, no. 1, November 1920, pp. 64–75, 1 plate.

Insect pests of maize are responsible for the loss of about 25 per cent. of the crop in South Africa. They include the stalk borer [*Busseola fusca*], cutworms, *Heliothis* (*Chloridea*) *obsoleta* (ear worm), *Heteronychus arator* and a weevil, *Strophosomus amplicollis.* The loss is valued at £1,350,000 annually, *B. fusca* alone being responsible for some £540,000.

Wheat pests include *Toxoptera graminum* (wheat aphis), which is of the greatest importance; a Coccinellid, *Epilachna similis,* which becomes at times a serious pest in the Eastern Province; and in the Western Province certain bugs, particularly *Blissus diplopterus,* Dist.

Olives are grown under extremely favourable conditions and would produce a very valuable crop if it were not for the depredations of the Tingid, *Teleonemia australis,* Dist., and the Chrysomelid, *Pseudococcinella sexvittata,* Chevr. When it has been demonstrated that these pests can be controlled by spraying and fumigation, it is hoped that the cultivation of olives will greatly increase.

Certain insects are always present, such as *Pseudococcus* spp. (mealybugs) on vines, bagworms on wattle, and termites. Others that are less uniformly abundant include *Cirphis* (*Leucania*) *unipuncta* (American army worm) and *Laphygma exempta* (South African mystery worm). The extreme fluctuations in the numbers of these moths are not sufficiently understood; natural enemies, climatic conditions and variations in farm practice may all be factors influencing their abundance; knowledge of the causes of fluctuation might provide a clue to successful remedial measures.

Some of the remedial measures that have turned failure into success in South African cultivation are briefly reviewed. *Phylloxera* threatened the grape industry with extinction until a resistant stock was discovered; the Australian scale [*Icerya purchasi*] was ruining *Citrus* and other crops until its natural enemy, *Novius cardinalis,* was introduced. Peach trees were smothered with the scale, *Aulacaspis* (*Diaspis*) *pentagona,* and plum trees with the mite, *Bryobia* sp., until sprays of lime-sulphur and salt saved the trees. Fumigation has been revolutionised by the application of the principle of reducing hydrocyanic acid gas to liquid form by cooling. Many other problems still await solution, and the need is urged for making every possible provision in the form of endowment for educational institutions, so that the highest possible efficiency may be secured in training those who show ability.

Martin (J. F.), Stene (A. E.) & Sheals (R. A.). **How to distinguish and combat the White Pine Blister Rust.**—*Rhode Island State Bd. Agric., Entom. Dept., Kingston,* Bull. N.S. no. 1, February 1920, 38 pp., 13 plates. [Received 21st December 1920.]

Insect injury to white pines [*Pinus strobus*] has often been mistaken for blister rust. The life-histories of the insects involved are here briefly discussed, and remedial measures advocated. They include:—the white pine weevil [*Pissodes strobi*]; the pine bark Aphid [*Chermes pinicorticis*]; the European pine-shoot moth [*Rhyacionia buoliana*] and the European pine sawfly [*Diprion similis*]. The work of a bark-miner, probably *Marmara* sp., is also often confused with blister rust infection. Trees weakened by the disease are generally attacked by bark-beetles.

CHIARI (M.). **Due Vermi delle Castagne.** [Two Larvae injurious to Chestnuts.]—*Riv. Agric., Parma,* xxvi, no. 50, 10th December 1920, p. 631.

The larvae of *Cydia* (*Carpocapsa*) *splendana*, Hb. (chestnut tortrix) and *Balaninus elephas*, Gyll. (chestnut weevil) are briefly described.

In Italy *C. splendana* oviposits in June on chestnut, walnut, and hazel, and the caterpillars mine the fruit. Nuts thus injured are distasteful to cattle. *B. elephas* oviposits in June ; its larva attacks chestnuts and acorns. When the infested fruits fall, the larvae enter the ground and hibernate there. The only measure advised is the collection of infested fruits and their destruction by feeding to cattle.

MJÖBERG (E.). **De Rupsenvraat in de Tabakscultuur ter Oostkust van Sumatra.** [Caterpillar Injury to Tobacco Cultivation on the East Coast of Sumatra.]—*Meded. Deli Proefst., Medan,* Ser. 2, no. xv, 1920, 54 pp., 4 figs.

The development of tobacco cultivation on the East Coast of Sumatra has destroyed the balance of nature there, and during recent years there has been such a steady increase in leaf injury as to constitute a serious menace to tobacco, now the chief crop in Sumatra. The injury is due mainly to the caterpillars of *Heliothis* (*Chloridea*) *obsoleta*, F., *Prodenia litura*, F., and *Phytometra* (*Plusia*) sp. In the higher-lying plantations Orthoptera occur and are quite as harmful.

In 1918 the average of leaf injury from 80 estates amounted to 33 per cent., equivalent to a loss of about £750,000 at par. Handling, heavy rains, storms, and scorching by insecticides are responsible for 10 per cent. of this loss ; 90 per cent. may be ascribed to insect attack, 60 per cent. occurring in the field and 30 per cent. in the drying sheds.

Radical measures are now needed, and the author suggests that attention should be chiefly directed to suppressing the first generation in the fields. Severe damage is done during the first five weeks after the seedlings are planted out, and after harvesting the caterpillars of *Prodenia* and *Phytometra* are carried in large numbers into the drying sheds, where they continue feeding.

The seed-beds must be kept absolutely free from the caterpillars so that they can never act as foci of infestation. This is attained by spraying with a solution containing 2 per cent. lead arsenate and 3 per mille soap. The latter is best added in the form of a concentrated solution. The addition of soap is very advantageous, as the poison is better distributed and the spray adheres better and longer to the foliage. Repeated applications must be made as the protection only lasts for 4 to 6 days. The beds should not be watered on the same day after spraying, but the application should be particularly abundant either on the day of planting or on the day before ; the seedlings must be quite white with the poison when they are planted out, and will remain so for 7 to 10 days. The adhesive power of the spray is such that eight waterings are needed to wash it off completely. It can also withstand rain if it is not very heavy. This method renders superfluous the expensive cloth coverings for the seed-beds, estimated to cost on an average over £400 per estate per annum. Furthermore the cost of searching for caterpillars in the beds is saved.

This method was tried on a large scale in March and April 1920 on one estate with 7,000 seed-beds, and proved entirely successful. Paris green does not, however, give satisfactory results.

Up to the present in the field hand-picking and spraying with Paris green have been tried but have proved ineffective, as is shown by the steady increase of the caterpillars. A careful study on the spot of the most modern American practice as regards methods and plant is needed. Meanwhile the lead arsenate and soap spray may be used for the two first applications in the field ; for the third and subsequent applications less lead arsenate must be employed, as the older plants sometimes seem liable to become scorched. Even so low a strength as ⅓ per cent. has been used with success.

Injury in the drying sheds may be checked either by fumigating the leaves or by examining them for caterpillars. No definite data can be given on these points at present.

Trap-crops should be tried, and the author suggests beds of tobacco between the fields and the jungle. These must be ready before the seedlings are planted in the fields ; by keeping them stocked with plants younger than those in the fields, their attractiveness is enhanced. The trap-beds should be protected by poisons ; then spraying must be discontinued, and the poison washed off by watering. After a 14-day interval (during which the caterpillars cannot attain maturity) the plants may either be burned or twice sprayed with a powerful poison. After the latter has acted it should be washed off the plants, and another 14-day interval must be allowed to elapse. This process may be repeated as long as the traps continue attractive.

In order to reduce the number of caterpillars during the 8 months when tobacco is not grown, it is necessary immediately to remove and destroy the plants from which the leaves have been harvested, as these constitute foci of infestation dangerous to the next crop. Trap-crops of tobacco grown for a period of 3 months before the tobacco season begins will also serve to reduce the total number of pests.

Palm (B. T.) & Mjöberg (E.). **Bestrijding van Rupsenvraat in Deli-Tabak. i. Effectieve Bescherming van Zaadbedden tegen Vraat.** [Measures against Caterpillar Injury to Deli Tobacco. i. The effective Protection of Seed-Beds against Attack.]—*Deli Proefst., Medan,* Vlugschrift no. 2, October 1920, 4 pp.

This method of protecting tobacco seed-beds by spraying with an emulsion of lead arsenate and soap is the same as that described in the preceding paper. Instructions for preparing the spray are given.

Smits van Burgst (C. A. L.). **In Nederland waargenomen Parasieten van de gestreepte Dennenrups** (*Trachea piniperda,* **Panz.** = *Panolis griseovariegata,* **Goeze).** [Parasites of the Pine Moth, *Panolis flammea,* Schiff., in Holland.]—*Tijdschr. Plantenziekten, Wageningen,* xxvi, no. 11, November 1920, pp. 201–207.

The following additional parasites of *Panolis flammea,* Schiff. (*piniperda,* Panz.) [*R.A.E.,* viii, 226] are recorded from Holland:—*Amblyteles rubro-ater,* Ratz., *Phygadeuon vagans,* Grv., *P. nubilipennis,* sp. n., *Angitia tenuipes,* Ths., and *Aphanistes armatus,* Wesm.

Hyperparasites are : *Hemiteles castaneus,* Tasch., *H. pedestris,* F., two other species of *Hemiteles, Astiphromma strenuum,* Holmgr., and two Chalcids. In the author's opinion their importance has been much overrated, as they do little except towards the end of an outbreak.

As material was not received from all the infested districts there may be other parasites, and for this reason it is not possible to state the percentage of parasitised caterpillars. Hymenopterous parasites

appear to have played the chief rôle, the Braconid, *Meteorus albiditarsis*, being the most important. Its attack takes place before the host caterpillar is half-grown, and its larva leaves the caterpillar before the latter pupates, spins a cocoon and hibernates, pupating in the following spring. After a pupal period of 14 days the adult Braconid emerges. *Ichneumon pachymerus* also parasitises the pine moth in the latter's larval stage, but towards its end, and the parasite larva pupates within the host cocoon after feeding on its contents.

It is remarkable that *M. albiditarsis* is almost unknown outside Holland as a parasite of *P. flammea*, and that parasites well known elsewhere are either scarce or altogether absent in Holland.

Most of the parasitic Diptera observed in 1919 were *Panzeria rudis*, and in localities where these flies were numerous, the parasitic Hymenoptera were present only in small numbers.

SCHOEVERS (T. A. C.). **Wintervlinderbestrijding.** [Measures against *Cheimatobia brumata*, L.]—*Tijdschr. Plantenziekten, Wageningen*, xxvi, no. 11, November 1920, p. 212.

Banding is the best method of combating the winter moth, *Cheimatobia brumata*, L. Failing this, recourse may be had to thorough spraying with 8 per cent. carbolineum in February or March, or spraying with Paris green (or other arsenical spray) as soon as injury is noticed.

La Convenzione Internazionale per l'Organizzazione della Lotta contro le Cavalette. [The International Convention for Organising Measures against Locusts.]—*L'Agric. Colon., Florence*, xiv, no. 11, November 1920, pp. 500–502.

This Convention met from 28th to 31st October 1920 at the International Institute of Agriculture in Rome, delegates being present from some 26 different countries.

An agreement was drawn up, and has already been signed by a number of the countries concerned, by which the contracting States undertake to combat locusts capable of causing losses to neighbouring signatory States and to inform the latter at once of the movements of such locusts. Special agreements are permissible between any of the States that wish to take combined action. The International Institute of Agriculture at Rome is to be recognised as the official centre for records and publications concerning anti-locust work, and the signatory States bind themselves to furnish the Institute once a year (or more often as circumstances may require) with authoritative information of a technical, scientific, legislative, and administrative character; the Institute is to give the widest and most speedy publicity to such information. Any proposal made by a signatory State tending to modify this present convention must be communicated to the Institute and submitted by the latter to a conference of delegates from the contracting countries, the conference being called at the time that a general meeting of the Institute is being held; the proposals made by the delegates must then be submitted for the approval of the contracting States. The present convention is to be signed and ratified as soon as possible, and the ratifications are to be delivered to the Italian Government, which will communicate the fact to the other contracting States and to the Institute. Any State, Dominion, or self-governing Colony that has not yet signed the convention may do so, and colonies may be admitted under the same conditions as apply to independent States,

if application is made by the States of which they are dependencies. This convention becomes operative within 3 months of ratification in the case of the first 3 States to ratify; for the remainder within 6 months of the ratification being handed to the Italian Government.

Piccinino (G.) & Tiberti (G.). **Description de l'Appareil, monté sur un Autochar, pour la Destruction des Sauterelles.**—*Genoa,* Tipografia operaia di Ciarlo Gio. Batta., 1920, 20 pp., 1 plate. (Notice in *L'Agric. Colon., Florence,* xiv, no. 11, November 1920, pp. 502–503.)

The authors have patented an arrangement consisting of a military searchlight mounted on a motor-car; this also carries a suction-fan apparatus within which revolve cylinders fitted with sharp blades.

The sudden, intense beam of light is intended to disturb and attract locusts, which are then sucked up and cut to pieces. The motor provides rapid carriage from one place to another.

As the principle on which this method is based has already been used in China against locusts, it is hoped that the new apparatus will be tested by experts.

da Costa Lima (A.). **Sobre os Casulos de dois Curculionideos, um das quaes é uma Especie nova de um novo Genero da Familia Orobitidae.** [The Cocoons of two Curculionids, one of which is a new Species of a new Genus of the Family Orobitidae.]—*Arch. Escola Sup. Agric. e Med. Vet., Nictheroy (Rio de Janeiro),* iv, no. 1, June 1920, pp. 9–14, 1 plate. [Received 21st December 1920.]

The cocoons of *Phelypera schupeli,* Bhn., from *Bombax monguba,* and all stages of *Malacobius capucinus,* gen. et sp. n., from an unknown plant are described.

Popenoe (W.). **The Avocado in Guatemala.**—*U.S. Dept. Agric., Washington, D.C.,* Bull. 743, 17th April 1919, 69 pp., 23 plates. [Received 21st December 1920.]

In the course of this paper dealing with the various races, uses and cultivation of the avocado a short chapter is devoted to its chief enemies in Guatemala. These include :—a new species of *Conotrachelus* [*perseae,* Barber] [*R.A.E.,* A, vii, 240], the larvae of which are sometimes found in mature avocados; *Ceratitis capitata* (Mediterranean fruit-fly), widely distributed and ranging from elevations of 1,000 to 5,300 feet; gall-making Psyllids, probably *Trioza koebelei,* Kirk., abundant and causing injury to the leaves; and *Caulophilus latinasus,* Say (broad-nosed grain weevil), infesting the seeds, as does also *Stenoma* sp.

The scale-insects infesting avocado trees include *Pulvinaria floccifera, Aspidiotus lataniae, A. subsimilis, Chrysomphalus dictyospermi, C. perseae, C. personatus* (masked scale), *C. scutiformis, Diaspis boisduvali, Pseudoparlatoria ostreata* and *Lepidosaphes mimosarum.* These scales are not very destructive in Guatemala, but their introduction into California or Florida should be strictly guarded against, as they might become serious pests under different conditions.

Gallard (L.). **Strawberry Culture around Sydney.**—*Agric. Gaz. N.S.W., Sydney,* xxxi, pt. 11, November 1920, pp. 815–820, 1 plate.

Strawberry pests in New South Wales include red spider [*Tetranychus*], which often attacks the under-surface of the leaves in hundreds, giving

them a creamy appearance and causing great loss of vitality in the plants. These mites are difficult to deal with while the plants are growing, but they may be killed in large numbers at the end of the season by burning the tops off together with the grass that comes up amongst them. A nicotine spray is effective where it can be applied without interfering with the fruit, but plenty of water is perhaps the best remedy.

Small weevils occasionally eat out the crowns of the plants, but several species of Coleopterous larvae are the worst pests, and have become more serious during the last few years. Sometimes a large bed will be so badly damaged by June that it is necessary to dig up and transplant the surviving plants. No effective measure against them is known. The adults, *Anoplognathus* spp., feed on the leaves of *Eucalyptus* and of apricot, plum and other fruit trees. If they are seen in an orchard near the strawberry plot, the trees should be sprayed with lead arsenate or Paris green, or the beetles should be beaten into sheets in the early morning or late afternoon.

Material assistance is derived from two insect enemies of these beetles, a blue Scoliid wasp (*Discolia soror*), which parasitises the larvae, and a Therevid fly (*Anabarrhynchus* sp.), the predaceous larva of which is very voracious and will attack almost any soft underground larvae.

RAMSAY (A. A.). **Potassium Cyanide for Trapping Fruit-flies.**—*Agric. Gaz. N.S.W., Sydney,* xxxi, pt. 11, November 1920, pp. 821–822.

In view of the successful use of weak solutions of potassium cyanide as a bait for fruit-flies, investigations were carried out to ascertain the rate of alteration or decomposition occurring in potassium cyanide solutions when so used. It was found that a ½ per cent. solution of potassium cyanide exposed in the shade in a cellar decomposes almost completely in fifteen days, and a 1 per cent. solution in seventeen days. When exposed to the action of both light and air, the rate of decomposition is much increased, a ½ per cent. solution decomposing almost completely in seven days, and a 1 per cent. solution in eight days.

In the case of aqueous hydrocyanic acid solutions exposed to light and air, decomposition takes place within twenty-four hours.

ILLINGWORTH (J. F.). **Cane Grub Investigations.**—*Queensland Agric. Jl., Brisbane,* xiv, no. 5, November 1920, pp. 245–246.

The Tachinid parasite, *Ceromasia sphenophori,* Vill., is still being bred and liberated, resulting in a noticeable decrease of sugar-cane borer beetles [*Rhabdocnemis obscura*]. *Phaenacantha australica,* Kirk. (linear bug) [*R.A.E.*, A, ix, 9] is particularly abundant in grassy fields, and the necessity of clean cultivation is emphasised. Destruction by fire may prove a successful remedial measure against this pest especially if applied to the surrounding grass-land as well as to the trash from the cane.

ARROW (G. J.). **Some New West Indian Species of the Melolonthid Genus** *Lachnosterna.—Bull. Entom. Res., London,* xi, pt. 3, December 1920, pp. 189–193, 1 fig.

Examples are given to show that the characters that have been given for defining the genera *Phytalus, Brahmina* and *Holotrichia* are incorrect,

and the author proposes to treat them all as one with *Lachnosterna.* At the same time it is pointed out that the generic name *Phyllophaga,* Harr., is a *nomen nudum.*

The new species described are *Lachnosterna jamaicensis* from Jamaica, *L. montserratensis* from Montserrat, *L. antiguae,* pupae and adults of which were found in numbers in the soil of sugar-cane fields, from Antigua and Dominica, and *L. acinosa* and *L. dilemma* from Trinidad.

Bezzi (M.). **Further Notes on the Lonchaeidae (Dipt.), with Description of New Species from Africa and Asia.**—*Bull. Entom. Res., London,* xi, pt. 3, December 1920, pp. 199–210.

Keys are given to the Ethiopian species of the genus *Lonchaea* (superseding that previously noticed [*R.A.E.*, A, vii, 243] owing to the addition of five new species), to the Indo-Australian species, of which two new species are described, and to the females of the subgenus *Carpolonchaea* from the Orient.

Marshall (G. A. K.). **Some New Injurious Weevils.**—*Bull. Entom. Res., London,* xi, pt. 3, December 1920, pp. 271–278, 1 plate.

The following new species are described :—Brachyderinae : *Tanymecus destructor,* which sometimes causes considerable damage to maize, and also feeds on the leaves of other crops, such as sweet potatoes, and *T. agricola,* which feeds on maize, both from South Rhodesia. Otiorrhynchinae : *Isaniris ater* from South Rhodesia and Nyasaland, which besides feeding commonly on trees of the genus *Brachystegia* attacks various cultivated plants, including *Citrus* ; *Systates exaptus,* which feeds on a number of different herbaceous plants, the adults sometimes causing appreciable injury to young maize plants, and *S. chirindensis,* which feeds on the leaves of coffee, both from South Rhodesia. Calandrinae : *Calandra shoreae,* which attacks the seeds of the sal tree (*Shorea robusta*) and of *Dipterocarpus turbinatus,* from India and Mauritius ; *C. glandium,* bred from acorns of *Quercus incana* and *Q. dilatata* from India ; and *Stenommatus musae,* which breeds in the root (corm) of banana, from the Hawaiian Islands.

Elytroteinus, nom. nov., is proposed for the genus *Pteroporus,* Fairmaire (*nec* Schönh.), of which the only known species, *E. subtruncatus,* Frm., originally described from Fiji, has recently been found at Honolulu attacking the roots of ginger (*Hedychium coronarium*).

MacGregor (M. E.). **A New Type of Entomological Killing-bottle.**—*Bull. Entom. Res., London,* xi, pt. 3, December 1920, pp. 283–285, 1 fig.

A killing-bottle for use with chloroform is described that has the merit of preventing the rapid evaporation of the fluid, so that 5 cc. of chloroform is sufficient for a week's use. The apparatus may be most easily made with a large test-tube, but could be adapted if a very large-mouthed bottle were required. The chloroform is kept at the bottom of the tube by a red rubber cork, through which passes a small piece of glass tubing (internal diameter, 2 to 3 mm.). None of the chloroform escapes owing to the air pressure at the upper end of the tubing, but there is always a high concentration of chloroform vapour in the test-tube.

Buxton (P. A.). **Insect Pests of Dates and the Date Palm in Mesopotamia and Elsewhere.**—*Bull. Entom. Res., London,* xi, pt. 3, December 1920, pp. 287–303, 1 plate.

This paper is to some extent a revision of a report previously noticed [*R.A.E.*, A, vii, 189] on the failure of the date crop in Mesopotamia in 1918, but in addition to dealing with the insects observed in that country, it gives a summary of all that has been written on date pests in various parts of the world, with a full bibliography.

The date pests that occur in Mesopotamia include :—Lepidoptera : *Spermatophora hornigii,* Led., and *Ephestia calidella,* Gn., which do little damage, *E. cautella,* Wlk., which is often a warehouse pest, *Arenipses sabella,* Hmps., which is apparently confined exclusively to stored dates, and an unidentified Gelechiid [the first moth mentioned in the previous report] which is a very serious pest. Coleoptera: *Oryctes elegans,* Prell ; (*Rhynchophorus ferrugineus,* Oliv., is considered almost certainly not to occur in Mesopotamia). Rhynchota : *Parlatoria blanchardi,* Targ. Acarina: *Oligonychus* (*Paratetranychus*) ? *simplex,* Banks, which is a serious pest, and is probably aided in its spread by the wasp, *Polistes hebraeus,* which frequents the diseased clusters of dates attacked by the mite.

Dietz (H. F.) & Barber (H. S.). U.S. Bur. Entom. **A New Avocado Weevil from the Canal Zone.**—*Jl. Agric. Res., Washington, D.C.,* xx, no. 2, 15th October 1920, pp. 111–116, 3 plates.

Heilipus perseae, sp. n., here described by Barber, was found in the Panama Canal Zone in native wild avocados. It is closely related to *H. lauri,* Boh., and *H. pittieri,* Barber, and has recently been intercepted entering the United States.

The eggs are laid on the fruit just under the skin. The young larvae often damage part of the pulp before entering the seed, but once in the latter they confine their activities to it.

If the embryo is not injured, the seed germinates ; but when a seed becomes infested with two or more larvae, it is usually so badly riddled that it cannot germinate. Seeds infested with larvae of *Heilipus* seem also to be subject to the attacks of several kinds of " dry rots," which follow along the tunnels, invade the embryo, and kill it. These fungi, at any rate under laboratory conditions, seem to be indirectly responsible for the death of a considerable number of larvae and pupae. No natural migration of larvae from one seed to another has been observed. The duration of the larval stage is probably not less than three months.

Pupation takes place in a spherical cell in the seed itself, and as many as four adults have been reared from a single seed. The minimum duration of the pupal stage is 12 to 15 days.

The adult weevils eat the young leaves, half-ripe fruit and stems of avocado, and fresh avocado seeds. In captivity they drank a considerable quantity of water. In fruit injury the outer skin was first eaten off, and then the surface of the pulp as it became dry. On the young stems the bark layers were gnawed off first and the woody areas were then eaten through, so that all the parts above the injury collapsed.

The weevils lived at least 10 days without food. The longest time any individual remained alive was 116 days. The apparently long duration of the larval stage and the known longevity of the adults indicate that there is but a single generation in a year. It is probable,

however, that breeding is controlled in the tropics to some extent by the activities of the food-plants in supplying proper conditions for oviposition.

Remedial measures consist in burning the fallen seeds and fruit to destroy the pupae. If, however, the presence of wild trees that are not readily accessible or easily eliminated makes this impracticable, it may be possible to protect cultivated fruit by arsenical sprays, for the weevils feed freely on the leaves and doubtless drink drops of water off them.

MERK-BUCHBERG (M.). **Die Spinnen in ihrer forstlichen Bedeutung.** [Spiders considered from the Point of View of their Importance in Forestry.]—*Der Deutsche Jäger*, xli, 1919, pp. 232–233. (Abstract in *Zeitschr. Pflanzenkr., Stuttgart*, xxx, no. 6–7, 1920, p. 230.)

Spiders of economic importance as destroyers of forest pests include: *Phalangina parietinum*, which preys on the spruce gall-midge, and allied species; *Epeira umbratica*, Cl., and species related to it; *Pholeus optioneides*, Schr.; *Drassus lapidicola*, Walck.; *Segestria sexoculata*, L.; *Thomisus vatius*, Cl.; *Micromata virescens*; *Artenes margaritatus*, Cl.; *Oxyopes ramosus*, Panz.; *Dolomedes mirabilis*, Cl.; *Dendriplantes rudis*, Koch; and *Saltiscus sceniscus*, Cl.

An appeal is made to foresters to collect further information on spiders.

UZEL (—) & RAMBOUSEK (—). **Ueber die schwarze Blattlaus.** [The Black Aphis.]—*Zeitschr. Zuckerind. Böhmen, Prague*, xliii, 1919, pp. 36–38. (Abstract in *Zeitschr. Pflanzenkr., Stuttgart*, xxx, no. 6–7, 1920, pp. 233–234.)

The black aphis of beet [*Aphis rumicis*] hibernates in the egg and larval stages. In autumn it occurs on *Atriplex* and *Capsella* (shepherd's purse), then on *Euonymus*, on which the winged individuals develop. These migrate to *Rumex*, *Chenopodium*, and nightshade before infesting beet.

EULEFELD (—). **Die Buchenwollschildlaus.** [The Beech Scale.]—*Deutsche Forstztg.*, xxxiv, 1919, p. 498. (Abstract in *Zeitschr. Pflanzenkr., Stuttgart*, xxx, 6–7, 1920, p. 236.)

Attention is drawn to the increase of the beech scale, *Cryptococcus* (*Coccus*) *fagi*, in the Vogelsberg region (Germany); trees may be killed as a result of severe infestations.

ZIMMERMANN (H.). **Ein neuer Schädling an Spargel und Bohne.** [A new Pest of Asparagus and Beans.]—*Blätter f. Obst-, Wein- und Gartenbau, Brünn*, xvii, 1919, pp. 10–11. (Abstract in *Zeitschr. Pflanzenkr., Stuttgart*, xxx, no. 6–7, 1920, p. 238.)

In south Moravia (Austria) *Phorbia* (*Chortophila*) *trichodactyla*, Rond., attacks asparagus as well as beans planted among asparagus beds.

HEDICKE (—). *Isosoma hordei*, **Harr., als Getreideschädling.** [*I. hordei* as a Pest of Corn.]—*Deut. ent. Zeitschr.*, 1919, pp. 205–206. (Abstract in *Zeitschr. Pflanzenkr., Stuttgart*, xxx, no. 6–7, 1920, p. 242.)

In 1830 *Harmolita* (*Isosoma*) *hordei*, Harr., was recorded in North America as a pest of various cereals, especially wheat and rye. In

England Walker recorded it from grass under the name of *Isosoma lineare*. In Central Europe it has, up to the present, been recorded from *Agropyrum* spp. only, from which von Schlechtendal described it in 1890 as *I. agropyri*. Its habits vary with the food-plant, and it does not appear to pass readily from one to another.

Stellwaag (F.). **Zusammenfassender Bericht über Versuche zur Bekämpfung der Traubenwickler mit Blausäure.** [A comprehensive Report on the Experiments with Hydrocyanic Acid Gas against Vine Moths.]—*Neustadt a. H.*, 1919, 12 pp. (Abstract in *Zeitschr. Pflanzenkr., Stuttgart*, xxx, no. 6–7, 1920, pp. 243–244.)

Against vine moths, fumigation with hydrocyanic acid has been shown to be ineffective, whereas solutions of hydrocyanic acid in water are very useful [*R.A.E.*, A, viii, 427]. The spraying must be done in winter ; if the application is made in summer, the green portions of the vine are scorched even with very weak solutions. These observations on the difference between summer and winter sprayings also apply to solutions containing derivatives of hydrocyanic acid which develop the gas on the vine-stocks. The use of these has the advantage of providing the vine-grower with solutions that are not particularly dangerous.

Krausse (A.). *Ennomos quercinaria*, **Hfn., als Waldverderber.** [*E. quercinaria* as a Forest Pest.]—*Zeitschr. Forst- und Jagdwesen*, 1919, pp. 153–159, 6 figs. (Abstract in *Zeitschr. Pflanzenkr., Stuttgart*, xxx, no. 6–7, 1920, p. 244.)

Beeches in the Saarbrücken district have been defoliated by the caterpillars of *Ennomos quercinaria*, Hfn. The flight period begins at the end of June. An Ichneumonid, *Pimpla examinator*, F., was bred from this moth.

Sedlaczek (W.). **Starkes Auftreten des grünen Eichenwicklers** (*Tortrix viridana*, **L.**) **in der Wiener Gegend.** [An Outbreak of *T. viridana* in the Vienna District.]—*Zeitschr. d. österreichischen Entomologenvereines, Vienna*, iv, 1919, pp. 78–79. (Abstract in *Zeitschr. Pflanzenkr., Stuttgart*, xxx, no. 6–7, 1920, pp. 244–245.)

Part of the sandstone area in the Wiener Wald has been severely infested by *Tortrix murinana*, Hbn., and *T. rufimitrana*, H. Sch., and some stands of firs are likely to disappear as a result of their attack, combined with the damage done by bark-beetles and fungi. Oaks are threatened by *T. viridana*, followed by attacks of oak mildew and other fungi, and by *Scolytus intricatus*, Ratz. Local preventive measures include the discontinuance of clear cutting of oaks in spring and summer, thus obviating shoots from the stumps later on and the consequent spread of mildew. The employment of natural enemies is the only method available against *T. viridana*.

Krausse (A.). **Ueber** *Dasychira pudibunda*, **L., bei Eberswald 1918.** [*D. pudibunda* at Eberswald in 1918.]—*Zeitschr. f. Forst- und Jagdwesen*, li, 1919, pp. 445–447. (Abstract in *Zeitschr. Pflanzenkr., Stuttgart*, xxx, no. 6–7, 1920, p. 246.)

The infestation at Eberswald of *Dasychira pudibunda*, L., was severe in 1918, though less so than in the preceding year [*R.A.E.*, A, vii, 454]. All the eggs, caterpillars and adults examined by the

author showed signs of polyhedral disease. The chief infestation was at the periphery of the area ravaged in 1917. The damage was such as to make it probable that a great many individuals must be immune from polyhedral disease.

KNISCHEWSKY (O.) & VOSS (G.). **Die Erdflöhe.** [Flea-Beetles.]—*Flugblattsammlung von E. Schaffnit, Bonn-Poppelsdorf,* no. 15, April 1919. (Abstract in *Zeitschr. Pflanzenkr., Stuttgart,* xxx, no. 6–7, 1920, p. 251.)

The appearance and habits of flea-beetles of the genera *Phyllotreta* and *Psylliodes* are described. Measures against them include burning all harvest débris ; the encouragement of rapid development of the young plants ; very early or very late sowing ; shading and the keeping damp of seed-beds by mulching with peat and watering ; dusting the plants with lime, tobacco, soot, etc. ; and collection of the adults on sticky racquets or boards.

SIEGMUND (—). **Mittel gegen Erdflöhe.** [Measures against Flea-Beetles.] —*Wiener landw. Ztg.,* lxix, 1919, p. 292. (Abstract in *Zeitschr. Pflanzenkr., Stuttgart,* xxx, no. 6–7, 1920, p. 251.)

The seed of rape, cabbage or other vegetables should be softened by soaking for a night in petroleum ; after draining, it must be mixed with dry sand. Germination will not be interfered with, and the young plants are immune from attack by flea-beetles.

LANDRY (A.). **Le grand Némate du Mélèze** (*Nematus erichsoni*).—*Natur. Canad., Quebec,* xlvii, no. 5, November 1920, pp. 99–112, 3 figs.

The morphology, biology and control of *Lygaeonematus* (*Nematus*) *erichsoni* (larch sawfly) are discussed, but little new information is given.

The insect parasites of *L. erichsoni* include :—*Mesoleius tenthredinis, Coelopisthia nematicida, Diglochis* sp., *Microcryptus labralis, Pteromalus nematicidus, Aptesis microcincta, Spilocryptus incubitor, Coelichneumon fuscipes, Cratichneumon annulator, Cryptus minator, Perilampus* sp., *Perilissus filicornis* and *Microgaster* sp.

DECOPPET (M.). **Le Hanneton.**—*Lausanne & Geneva,* Librairie Payot & Cie, 1920, 130 pp., 5 figs., 41 maps, 5 tables, 5 charts, 5 plates.

The object of this monograph is to collate the information obtained as the result of many years' observations on the incidence, life-history and habits of *Melolontha melolontha,* L., and *M. hippocastani,* F., with special reference to the canton of Zurich. The natural and artificial control of these cockchafers is dealt with, and a special chapter is devoted to the destruction of their grubs in forest nurseries.

The text of the legislation against these pests during 1870–1919 is given verbatim, and Perris' characters for the determination of the larval forms are included.

Attention is called to various organisations in other countries, such as the Imperial Bureau of Entomology, London, and the necessity for a similar well-organised service for the protection of cultivated plants in Switzerland is emphasised.

An extensive bibliography is appended.

Duport (L.). **Rapport sur les Recherches poursuivies à la Station Entomologique de Cho-Ganh.**—*Supplement to Bull. 128, Chambre d'Agric. Tonkin and Nord-Annam, Hanoi,* no. 9, May–August 1920, 7 pp. [Received 29th December 1920.]

Investigations on the insect parasites of *Xylotrechus quadripes* (coffee borer) have been continued and show that the Braconid parasite previously discussed [*R.A.E.*, A, viii, 220] is the only species sufficiently vigorous and prolific to be of any great value in combating this beetle in the field. The Bethylid found attacking *X. quadripes* has been identified as *Sclerodermus castaneus,* Kieff., and this parasite has also been found in company with *Chlorophorus annularis* in dry bamboo.

Schumacher (F.). **Beitrage zur Kenntnis der Hemipterenfauna Mazedoniens.** [Contributions to the Knowledge of the Hemiptera of Macedonia.]—*Sitzungsber. Ges. Naturforsch. Freunde, Berlin,* March–April and October 1918, nos. 3–4 and 8, 15th June and 10th December 1918, pp. 82–98 and 322–325.

In all, 199 species of Rhynchota collected in Macedonia are recorded. They include :—a Reduviid, *Ploiaria domestica,* Scop., found chiefly in houses, where it feeds on small flies, Culicids, etc. ; the Coccids, *Leucaspis riccae,* Targ., and *Lepidosaphes ulmi,* L. ; the gall-making Aphids, *Pemphigus utricularius,* Pass., *P. semilunarius,* Pass., and *P. derbesi,* Licht., on *Pistacia terebinthus ; P. pallidus* Hal., *Eriosoma* (*Schizoneura*) *lanuginosum,* Hausm., *Tetraneura ulmi,* de G., and *T. rubra,* Licht., on *Ulmus* sp. ; *Myzus* sp. on *Prunus domestica* ; a Capsid, *Poeciloscytus cognatus,* Fieb., on *Salsola kali ; Lygus pratensis,* L. ; and a Cicadid, *Tettigia orni,* L., on plane trees.

Schumacher (F.). **Entomologisches aus dem Botanischen Garten zu Berlin-Dahlem. i.** *Orthezia insignis,* **Douglas.**—*Sitzungsber. Ges. Naturforsch. Freunde, Berlin,* November–December 1918, no. 9–10, 28th February 1919, pp. 379–384.

Orthezia insignis, Dougl., is recorded from 32 different plants in greenhouses at the Botanical Gardens, Berlin. The danger of its further spread and the necessity for strict vigilance against this scale are emphasised. *O. insignis* does not apparently occur in the open in Germany owing to climatic conditions, but in greenhouses reproduction continues uninterruptedly throughout the year. A powerful spray of water or of petroleum emulsion is recommended against it. No parasites of it have so far been discovered in Germany. Its occurrence in other countries is reviewed.

Schumacher (F.). **Entomologisches aus dem Botanischen Garten Berlin-Dahlem. iii.** *Gymnaspis aechmeae,* **Newst.**—*Sitzungsber. Ges. Naturforsch. Freunde, Berlin,* May–June 1919, no. 5–6, 6th October 1919, pp. 250–254.

Gymnaspis aechmeae, Newst., occurs abundantly on numerous plants of the order of Bromeliaceae in the Botanical Gardens in Berlin. It causes severe damage to pineapple plants. This scale has become firmly established, and is also found in the orchid houses. Apparently the only means of reducing its ravages is to transfer infested plants into the open or into cooler houses, as it is only able to reproduce at a high temperature.

SCHULZ (U. K. T.). **Beiträge zur Biologie von** *Lariophagus distinguendus*, **Först.** [Contributions to the Biology of *L. distinguendus*, Först.]—*Sitzungsber. Ges. Naturforsch. Freunde, Berlin,* November 1919, no. 9, 16th January 1920, pp. 375–377, 3 figs.

The parasitism of *Calandra granaria*, L., by *Lariophagus distinguendus*, Först., is discussed.

METALNIKOW (S.). **L'Immunité naturelle et acquise chez la Chenille de** *Galleria mellonella*. [Natural and acquired Immunity in the Caterpillars of *G. mellonella*.]—*Ann. Inst. Pasteur, Paris,* xxxiv, no. 11, November 1920, pp. 888–909, 5 figs.

The technique employed during a series of experiments on the natural and acquired immunity of the larvae of *Galleria mellonella* is described. The results of these observations have been noticed elsewhere [*R.A.E.*, A, viii, 163, 367; B, viii, 86].

VAN POETEREN (N.). **Verslag over de Werkzaamheden van den Phytopathologischen Dienst in het Jaar 1919.** [Report on the Work of the Phytopathological Service in the Year 1919.]—*Verslagen en Meded. Phytopath. Dienst, Wageningen,* no. 12, June 1920, 48 pp. [Received 30th December 1920.]

A Nematode, *Tylenchus devastatrix*, infested clover; another species, *T. pratensis*, de Man, occurs in the roots of *Convallaria* (lily of the valley) intended for export, and attempts are being made to find a remedy for it. *Porthetria dispar* attacked shade-trees. Apple tree pests included the woolly aphis [*Eriosoma lanigerum*], of which the winged individuals were observed for the first time in Holland. Benzine is said to give excellent results against this pest. *Paratetranychus* sp. was reported several times, and *Hyponomeuta* sp. was abundant in Zeeland. The bags used to protect graftings against *Phyllobius* must be tied tightly to prevent this beetle from entering.

Incurvaria capitella infested red currants. A bug, *Lygus* sp., caused some injury to beans; no effective remedy has been found to obviate the frequent replacement of sticks rendered necessary by the fact that old sticks favour infestation. They appear to lead to the infestation of the new crop, though neither eggs nor larvae could be found on them in winter. Attempts to disinfect the old sticks with carbolineum were unsuccessful. *L. pabulinus* and *L. pratensis* severely injured *Viburnum*. *Pieris brassicae* and *P. rapae* did considerable damage to cabbages.

In North Brabant bees were poisoned in large numbers, and as traces of copper and arsenic were found, the sprays used against *Pteronus ribesii* and *Cheimatobia brumata* appear to have been the cause. The difficulty can be overcome by a regulation fixing the date for spraying against *P. ribesii* after blossoming, while *C. brumata* can be checked by spraying its eggs in winter with carbolineum.

The investigations on apples and pears infested with insect larvae are not yet complete, but it has been ascertained that most of the larvae in young fallen apples are those of the sawfly *Hoplocampa testudinea*; the caterpillars of *Cydia* (*Carpocapsa*) *pomonella* appear at a later date. More fruits are infested by *Hoplocampa* than by *Cydia*. Spraying with Paris green will check both these pests to a considerable degree.

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Taylor (R. H.). **The Almond in California.**—*Agric. Expt. Sta. Berkeley, Cal.*, Bull. 297, August 1918, 72 pp., 28 figs.

In this extensive bulletin on the cultivation of almond trees a chapter is devoted to the more serious insect pests of this crop and their control. The insects dealt with include the mites *Bryobia pratensis* and *Tetranychus telarius*, *Anarsia lineatella* (peach twig borer), *Aegeria opalescens* (California peach borer), thrips, grasshoppers, and *Plodia interpunctella* (Indian meal moth).

Cobb (N. A.). **Transference of Nematodes (Mononchs) from Place to Place for Economic Purposes.**—*Science, Lancaster, Pa.*, li, no. 1330, 25th June 1920, pp. 640–641.

Parasitic Nematodes of plants are held in check in many instances by a useful group of Nematodes known as mononchs, but as these generally feed on the other Nematodes found in the soil around the infested plant and not on those in the plant itself, the destructive species are frequently imported into fresh areas without their enemies. The value of mononchs as enemies of Nematodes and the advisability of their introduction into infested areas is emphasised.

Fuchs (G.). **Die Naturgeschichte der Nematoden und einiger anderer Parasiten (1) des** *Ips typographus*, **L., (2) des** *Hylobius abietis*, **L.,** [The Natural History of Nematodes and other Parasites of *Ips typographus*, L., and *Hylobius abietis*, L.]—*Zool. Jahrb., Jena*, Abt. Syst. Geogr. & Biol., xliii, nos. 1–4, 1920, pp. 109–222, 5 plates, 2 figs.

Part of the information in this paper dealing with Nematodes associated with the beetles, *Ips typographus* and *Hylobius abietis*, has been previously noticed [*R. A.E.*, A, ii, 375]. Other organisms infesting *Ips typographus* are *Gregarina typographi*, sp. n., *Telosporidium typographi*, sp. n., and a Hymenopterous parasite, *Diplochis omnivorus*, Wlk. The last-named apparently infests the adult beetles.

Enderlein (G.). **Zur Kenntnis tropischer Frucht-Bohrfliegen.** [A Contribution to the Knowledge of tropical Fruit-flies.]—*Zool. Jahrb., Jena*, Abt. Syst. Geogr. Biol., xliii, nos. 1–4, 1920, pp. 336–360.

This paper deals with some 54 tropical Trypetids. The new species described are *Xaniosternum aphioneum*, gen. et. sp. n., from West Africa; *Axania ichneumonea*, gen. et. sp. n., from North India; *Stenotrypeta torrida*, gen. et sp. n., from East Africa; *S. punctum*, from Spanish Guinea; *Stigmatothemara pterocallina*, gen. et sp. n., from Kamerun; *Copiolepis quadrisquamosa*, gen. et sp. n., from the Bismarck Archipelago; *Conradtina limbatella* and *C. limbata*, from Kamerun; *C. fenestrata* and *C. conjuncta*, from Spanish Guinea; *Ceratitis procera*, from Spanish Guinea and Kamerun; *C. tessmanni*, and *C. nigribasis*, from Spanish Guinea; *C. ochriceps*, from East Africa; *C. laqueata*, from Java; *C. festiva*, *C. faceta*, *C. pinnatifemur* and *C. arguta*, from Spanish Guinea; *C. bicincta*, from the Gold Coast; *C. patagiata*, from East Africa; *Gastrozona albiscutellata*, from Sumatra; *Chelyophora lemniscata*, from East Africa; *Carpophthoromyia amoena*, from Kamerun; *C. fülleborni*, from East Africa;

Callantra icariiformis, from Sikkim and Burma; *Polistomimetes minax,* gen. et sp. n., from Sikkim; *P. infestus,* from Sumatra; and *Adrama spinata,* from the Bismarck Archipelago.

Since writing this paper the author has seen Bezzi's notes on Ethiopian fruit-flies [*R.A.E.*, A, vi, 208]. According to this, the new species of *Ceratitis* should be distributed among Bezzi's genera as follows:—*C. ochripes, C. festiva, C. faceta, C. bicincta, C. patagiata,* and *C. argula* belong to *Trirhithrum,* Bezzi, 1918; *C. laqueata, C. grata,* Wied., and *C. formosula,* Aust., are intermediate between *Pardalaspis,* Bezzi, 1918, and *Trirhithrum,* between which the author cannot trace any morphological difference (the latter being a synonym of the former); *C. pinnatifemur* belongs to *Pterandrus,* Bezzi, and *C. procera, C. tessmanni* and *C. nigribasis* to *Carpophthoromyia,* Aust.

The Danger lurking in imported Cotton Seed.—*Jl. Dept. Agric. Union S. Africa, Pretoria,* i, no. 9, December 1920, pp. 798–799.

The importance of maintaining continued vigilance against the importation of cotton pests is illustrated by an instance in which numerous examples of all stages of the pink bollworm (*Platyedra gossypiella*) were found in a small package of seed at Durban belonging to a passenger for Portuguese East Africa, several of the larvae and pupae being alive.

Beetle Pest.—*Jl. Dept. Agric. Union S. Africa, Pretoria,* i, no. 9, December 1920, p. 803.

Cockchafer outbreaks have been more numerous than usual in the Transvaal. *Adoretus tessulatus,* Burm., was apparently the chief species concerned. Grape-vines, roses, plums and almonds suffered most, but peach, apricot, nectarine, apple, pear, cherry, oak, cabbage, cauliflower and turnip were also attacked.

The immature stages are passed in the ground, and the beetles emerge in the spring. Spraying with 4 oz. of lead arsenate in 4 gals. water is advocated against them. It is advisable to use half this amount, with the addition of an equal quantity of lime, when spraying fruit trees. Hand collection is effective in small gardens.

The Mally Fruit Fly Remedy. For the Prevention of Maggots in Fruit by the Destruction of Parent Flies before Eggs are Laid—*Jl. Dept. Agric. Union S. Africa, Pretoria,* i, no. 9, December 1920, pp. 859–861.

The Mally poison bait [*R.A.E.*, A, iv, 392] is advocated for the destruction of adult fruit-flies prior to oviposition. The best time for applying it to various crops is discussed.

Britten (H.). **Interesting Insects imported into Manchester.**—*Lancashire & Cheshire Naturalist, Manchester,* xiii, nos. 5–6, November–December 1920, pp. 95–96.

A beetle, *Lophocateres pusillus,* Klug, is recorded from among debris of butter-beans in company with an undetermined Scolytid, probably *Hypothenemus* sp., and an ant, *Cardiocondyla britteni.*

A Tenebrionid beetle, *Helops lanipes*, L., was found in a jam factory, probably having been imported with fruit from France or Algeria. Another Tenebrionid, *Hegeter amaroides*, Sol., found was probably introduced with bananas from Teneriffe.

LYLE (G. T.). **Contributions to our Knowledge of the British Braconidae.**—*Entomologist, London*, liv, no. 692, January 1921, pp. 6–8.

The species dealt with include *Orgilus obscurator*, Nees, bred from the larva of *Rhyacionia* (*Retinia*) *buoliana*. A key to the species of Orgilus given.

BALLOU (H. A.). **The Pink Bollworm in the West Indies.**— *Agric News, Barbados*, xix, no. 484, 13th November 1920; no. 485, 27th November 1920; no. 487, 24th December 1920; pp. 362, 378, & 410–411, 3 figs.

The first article of this series gives a brief account of infestation by the pink bollworm [*Platyedra gossypiella*] in various countries, and points out the necessity for every possible precaution being taken against its entry into the West Indies. By 27th November 1920, however, the presence of the pest had already been recorded in Montserrat, and both there and in St. Kitts it has been found to be well established. Extermination is impossible with the present state of labour in the Islands, and attention must therefore be given to remedial measures, by means of which it is hoped to keep the pest sufficiently in check to render cotton growing profitable. The usual methods of cleaning up the fields and burning rubbish immediately the crop is removed are recommended, and also the disinfection by heat of seed for planting. All other seed should be either shipped out of the island, crushed in the oil mills or treated for destruction of the larvae. In Montserrat all cotton plants should be pulled up and burnt, and all fallen bolls gathered from the ground and burnt not later than 31st December; planting should not begin before 1st March, and all seed should be shipped away or treated to destroy the bollworm not later than 1st April. In St. Kitts, the respective dates should be 31st January, 1st March and 15th April. In planting the new crop no seed from any infested district should be used; it is suggested that in Nevis and the Virgin Islands only Nevis-grown seed should be used for planting. *P. gossypiella* in seed can be killed by heating the seed to a temperature of 130° F. for five minutes. Germination is not impaired if the temperature does not go above 149° F. During 1921 the dates for the various treatments must be arranged as early as possible, and machines should be in readiness in each island to deal with the seed. The necessary legislation and inspection must also be determined at an early date.

Legislation with Regard to Pink Bollworm of Cotton.—*Agric. News, Barbados*, xix, no. 487, 24th December 1920, pp. 408–409.

Immediately upon the discovery of the presence of *Platyedra gossypiella* (pink bollworm) in the West Indies, an order was passed on 17th November 1920, forbidding the importation into Barbados

of all cotton seed from the Islands of Montserrât, St. Kitts, Nevis and Anguilla. A proclamation by the Governor of Trinidad, dated 20th November 1920, prohibits the importation into the Colony of cotton seed, seed cotton, and ginned cotton, except under a permit issued by the Director of Agriculture. Regulations were passed during November and December 1920, prohibiting the importation into St. Vincent, St. Kitts, Nevis and Anguilla of cotton seed, lint cotton, seed cotton, and of any packages, coverings, bags, or other articles used in connection with such material, without permission of the authorities.

A Note on the Mosaic Disease of Sugar-cane.—*Agric. News, Barbados,* xix, no. 484, 13th November 1920, p. 366.

Mosaic disease of sugar-cane is spreading rapidly throughout the West Indies, and a similar disease has recently been discovered in maize. To test the manner of dissemination, twelve individuals of *Aphis maidis* were removed by a camel's hair brush from diseased sorghum plants, and placed upon maize seedlings in insect-proof cages. The same number were similarly transferred from healthy sorghum to other maize seedlings in a similar cage. In less than one month eight of the twelve seedlings in the first cage showed evidence of mosaic disease, while those in the control cage remained perfectly healthy. It is clear, therefore, that the disease can be dispersed to an almost unlimited extent by this Aphid; and there is, further, no reason to suppose that transmission in nature is limited to it. The possibility of eliminating the disease is discussed, but it is thought that legislation and quarantine laws must be passed before this can be accomplished.

Haber (V. R.). **Oviposition by an Evaniid, *Evania appendigaster,* Linn.**—*Canad. Ent., London, Ont.,* lii, no. 11, November 1920, p. 248, 1 fig.

The oviposition of *Evania appendigaster,* L., in an egg-mass of the cockroach, *Blatta orientalis,* L., in captivity is recorded.

Heinrich (C.). **The Pea Moth a New Species.**—*Canad. Ent., London, Ont.,* lii, no. 11, November 1920, pp. 257–258, 2 figs.

Cydia (*Laspeyresia*) *novimundi,* sp. n., is described from garden and field peas in Wisconsin. This species was formerly identified as the European pea moth, *C.* (*L.*) *nigricana* [*R.A.E,* A, viii, 532], but is readily separable by the characters of the male genitalia, which are described and figured. If *L. novimundi* is not a native species that has passed to the pea from some wild legume, it has probably been introduced from the Orient; in any case, it has been incorrectly recorded as *C. nigricana.*

Timberlake (P. H.). **New Genera and Species of Encyrtinae from California parasitic in Mealybugs (Hymenoptera).**—*Univ. California Pubns. Ent., Berkeley,* i, no. 8, 28th March 1918, pp. 347–367, 7 figs. [Received 6th January 1921.]

The species dealt with include:—*Acerophagus fasciipennis,* sp. n., reared from early larval stages of *Pseudococcus crawi,* Coq.; *A.*

notativentris, Gir., from *Pseudococcus* sp. on grape; *A. pallidus,* sp. n., from *P. yerbasantae,* Essig; *Stemmatosteres apterus,* gen. et sp. n., from *P. timberlakei,* Ckll; *Pseudococcobius fumipennis,* sp. n., from *Pseudococcus solani,* Ckll; *Pseudococcobius clauseni,* sp. n., from *Erium* sp. on cactus; *Pseudococcobius ehrhorni,* Timb., for which a new genus, *Cirrhencyrtus,* is erected, reared from *Pseudococcus ryani,* Coq.; *Paraleptomastix abnormis,* Gir., type of a new genus, *Tanaomastix,* parasitic on *Pseudococcus* spp.; *T. claripennis,* sp. n., reared from *P. ryani*; *T. abnormis,* Gir., reared from a species of *Pseudococcus* (not *P. citri,* Risso) on *Citrus* in Japan, and introduced into Southern California from Sicily to check *P. citri*; and *T. albiclavata,* Ashm., reared from *Pseudococcus* sp. from the Philippine Islands.

Swain (A. F.). **A Synopsis of the Aphididae of California.**—*Univ. California Pubns. Ent., Berkeley,* iii, no. 1, 1st November 1919, pp. 1–221, 17 plates. [Received 6th January 1921.]

The new Californian Aphids here described include:—*Lachnus sabinianus,* on digger pine (*Pinus sabiniana*); *L. vanduzei,* on spruce; *Macrosiphum rudbeckiae,* Fitch, var. *madia,* n., on tarweed (*Madia sativa*); and *Aphis viburnicolens* on laurestinus (*Viburnum tinus*) and laurel.

Keys are given to the genera and tribes of Aphids after Van der Goot, and a complete list of the food-plants of Californian Aphids is appended.

Clausen (C. P.). **Life History and Feeding Records of a Series of California Coccinellidae.**—*Univ. California Pubns. Ent., Berkeley,* i, no. 6, 17th June 1916, pp. 251–299. [Received 6th January 1921.]

The species dealt with include:—*Coccinella californica,* Mann.; *C. trifasciata,* L., which in several localities has exercised a considerable check on the numbers of *Macrosiphum rosae* (rose aphis); *Hippodamia convergens,* which is predaceous on many Aphids, including *Phorodon humuli* (hop aphis), *M. rosae, Pemphigus betae* (beet aphis), *Aphis nerii* (oleander aphis), *Aphis rumicis* (bean aphis), *Hyalopterus arundinis* (plum aphis), *A. gossypii* (melon aphis) and, less frequently, on *Chromaphis juglandicola* (walnut aphis), *Eriosoma* (*Schizoneura*) *lanigerum* (woolly apple aphis), and *Brevicoryne* (*Aphis*) *brassicae* (cabbage aphis); *Hippodamia ambigua,* Lec.; *Olla abdominalis,* Say, one of the most important enemies of Aphids in California, feeding upon many species, but showing a decided preference for *C. juglandicola*; *O. oculata,* F., generally found in association with the last-named; *Adalia bipunctata,* L., predaceous upon all the commoner Aphids; and *Cycloneda sanguinea,* L., which feeds extensively on *Erisoma lanigerum* and the commoner Aphids.

The life-histories, seasonal occurrence, oviposition records and feeding records of larval and adult stages of each species are worked out. The average life-cycle of any of these species in Californian summer conditions is approximately 27 days; of these, five are passed in the egg-stage, five in the first larval stage, three in each of the second and third larval stages, six in the fourth stage, and five in the pupal stage. The number of Aphids eaten by the larvae is, generally speaking,

in proportion to their size, and the same is true to some extent of the adults. Temperature and humidity are strong factors in the development and behaviour of the various species. The number of eggs laid under normal field conditions varies from 200 to 500, occasionally more, and extends over a period of from four to eight weeks under optimum conditions.

ESSIG (E. O.). **Aphididae of California: New Species of Aphididae and Notes from various Parts of the State, but chiefly from the Campus of the University of California, Berkeley, California.**—*Univ. California Pubns. Ent., Berkeley,* i, no. 7, 20th July 1917, pp. 301–346, 30 figs. [Received 6th January 1921.]

The new species described are:—*Myzocallis arundinariae* and *M. arundicolens,* on various kinds of bamboo; *Symydobius agrifoliae,* in colonies on the bark, and sometimes the leaves, of the coast live oak, *Quercus agrifolia*; *Myzus aquilegiae,* on *Aquilegia truncata* and *A. chrysantha*; *Aphis cari,* on wild anise, *Carum kelloggi,* and occasionally on *Angelica tomentosa.*

Notes are given on a number of other Aphids injurious to plant life in California.

KOFOID (C. A.) & SWEZY (O.). **Studies on the Parasites of the Termites. i–iv.**—*Univ. California Pubns. Zool., Berkeley,* xx, nos. 1–4, 14th July 1919, pp. 1–116, 14 plates, 8 figs. [Received 6th January 1921.]

These papers deal with the following flagellates, occurring as intestinal parasites of *Termopsis angusticollis,* Wlk.:—*Streblomastix strix,* gen. et sp. n.; *Trichomitus termitidis,* sp. n., which is apparently not injurious to its host, but feeds on the debris of the intestinal contents, a new sub-genus, *Trichomitopsis,* being erected for it; *Trichonympha campanula,* sp. n.; and *Leidyopsis sphaerica,* gen. et sp. n.

HESS (W. N.). **The Ribbed Pine-Borer,** *Rhagium lineatum,* **Oliv.**—*Cornell Univ. Agric. Expt. Sta., Ithaca, N.Y.,* Mem. 33, May 1920, pp. 367–381, 1 plate, 6 figs. [Received 6th January 1921.]

Rhagium lineatum, Oliv., is one of the commonest and most widely distributed Cerambycids in North America, being especially abundant in Central Pennsylvania and about Ithaca, New York, where the present investigations were made. Some authors regard the American form merely as a variety of the European *R. inquisitor,* but in the present paper the insect is given specific rank. All the common species of pine are attacked, though white pine (*Pinus strobus*), pitch pine (*P. rigida*) and red pine (*P. resinosa*) are apparently preferred. All stages of the insect are described. The beetles begin to emerge about the last week in April, and feed on the pollen of various flowers. Mating occurs soon after emergence, and oviposition begins about the middle of May. A single female lays from 120 to 165 eggs, in masses of about 20, in crevices between the layers of the outer bark. These hatch in from 8 to 10 days, the young larvae working their way through the bark, where they feed during the whole larval life on the

tissues of the cambium layer. Two years are required for the life-cycle, the first winter being spent in the larval stage. The movements of the larvae are irregular, so that a blotch-like mine of considerable extent is frequently formed. About September of the second year pupation occurs, and lasts from about 16 days to a month or more, according to the season. The adults pass the second winter in the pupal cells, and bore their way out when the first warm days occur.

Very little damage is done to living pines, the females choosing, when possible, recently dead trees for oviposition; they will oviposit again the second year, but trees that have been dead three years are seldom attacked, as there is little cambium left. Considerable damage is, however, done to recently dead timber. The excavations frequently loosen the bark, allowing moisture to enter, and this is retained by the large masses of frass and encourages fungus growth. The exit holes of the adults also admit water, fungi, and other insects, and the infested logs are soon rendered useless for commercial purposes. The insects may be found from the base to near the top of the tree, but never occur in the limbs, unless these are very large.

Predatory enemies of *R. lineatum* include woodpeckers and other birds, ants, and probably centipedes, Staphylinids, Carabids, etc. The parasite, *Atanycolus simplex*, Cress., destroys at the most 5 per cent. of the larvae. Artificial remedies consist of the cutting and removal of all recently killed pines before 1st March. This will kill both larvae and adults. The placing of newly felled logs in water will prevent oviposition, or carbolineum, applied in May, has the same effect. These methods have largely reduced damage by this beetle about Ithaca.

MONTGOMERY (J. H.). **Notes from the Quarantine Department.**—*Qtrly. Bull. State Plant Bd. Florida, Gainesville*, v, no. 1, October 1920, pp. 1–5. [Received 6th January 1921.]

Owing to the danger of introduction of various fruit-flies, the State Plant Board has passed a rule prohibiting the importation into Florida of all guavas, mangos, Cuban plums, Surinam cherries, etc., from countries where the West Indian fruit-fly [*Anastrepha fraterculus*] is known to be established.

Epilachna corrupta, Muls. (Mexican bean beetle) has recently been discovered in Alabama, in bean and cowpea fields. As this beetle attacks all members of the pea and bean family, and as it is apparently well established, an important source of food is threatened. An attempt will be made to eradicate the pest before it becomes more widely distributed, and a request has been made to the Federal Horticultural Board to impose a federal quarantine on the shipment of dangerous material from the infested areas.

Strenuous efforts are being made to eradicate the sweet potato weevil [*Cylas formicarius*] from Florida. Emphasis is laid on the importance of growers avoiding the use of plants from any locality that is likely to be infested.

It is recognised that there is serious danger of the black fly [*Aleurocanthus woglumi*] being introduced into the extensive citrus-producing regions of Florida, and the Federal Horticultural Board is in consequence considering the imposition of federal quarantine restrictions on importations likely to introduce the fly from other countries.

MOZNETTE (G. F.). U.S. Bur. Ent. **The Dictyospermum Scale on the Avocado and how it may be controlled.**—*Qtrly. Bull. State Plant Bd. Florida, Gainesville,* v, no. 1, October 1920, pp. 5–11, 1 plate. [Received 6th January 1921.]

Chrysomphalus dictyospermi, Morg., is a particularly destructive scale on avocado in Florida, especially where the temperature is uniform and in the more protected localities. Other food-plants are *Dictyospermum album* (the original host), *Erythrina indica,* sago and other palms, tea, rubber (*Ficus*), *Citrus,* orchids, camphor, coconut, guava, mango, pecan, rose, banana, and many others. The males have not been observed in Southern Florida, and apparently the species is parthenogenetic there. The young may be seen crawling about the twigs and branches about 1st March. A generation at this time requires about seven weeks to mature in the open ; during the warmer months the life-cycle is shorter, and the generations overlap considerably. In the cooler weather of December and January the life-cycle occupies over 2½ months ; there are generally five or six generations in a year. The insect is found only on the branches (the lower ones for choice), twigs and leaves. It does not produce honey-dew, but likes to shelter under the sooty mould produced by *Trialeurodes floridensis,* Quaint. (avocado white-fly). A parasite of considerable economic importance is *Aspidiotiphagus citrinus,* Craw.

Tests with various insecticides have shown that caustic potash fish-oil soap, lime-sulphur solution and miscible oils are none of them efficient, but one gallon of oil emulsion to 70 U.S. gals. water, used twice during the dormant season, was found to clear the trees of both *C. dictyospermi* and sooty mould, generally within about a week. If separation of the oil occurs owing to the hardness of Florida water, 2 or 3 lb. of caustic potash fish-oil soap should be added to a 125 U.S. gallon tank before the emulsion is put in.

The Yam Weevil.—*Qtrly. Bull. State Plant Bd. Florida, Gainesville,* v, no. 1, October 1920, p. 27, 1 fig. [Received 6th January 1921.]

The interception of *Palaeopus costicollis,* Mshl. (yam weevil) in the luggage of a passenger from Jamaica to South Carolina is recorded. The one yam contained 14 adults, 23 pupae and 12 larvae of this insect, which is not yet known to occur in the United States.

SHERMAN (F.). **Report of the Division of Entomology.**—*42nd Ann. Rept. North Carolina Agric. Expt. Sta., 1918–19, Raleigh,* 1919, pp. 54–58. [Received 6th January 1921.]

Studies on the larger corn stalk borer [*Diatraea saccharalis*] have extended over the last five years. It is found that numbers of the over-wintering larvae are killed by ploughing the stubble in the autumn. Injury is also reduced by planting after 25th May, as maize planted after this date is attacked by only one generation of the moth, while that planted earlier is subject to attack by two. Cabbage worms [*Pieris rapae*] can be controlled by dusting the plants weekly with one part lead arsenate to eight of air-slaked lime.

A severe outbreak of the green clover worm [*Plathypena scabra*] occurred among soy beans in July and August. Experiments showed

that one part of lead arsenate to eight parts of dust lime was a successful remedy, and liquid spraying is also effective. Both the fall army worm [*Laphygma frugiperda*] and the true army worm [*Cirphis unipuncta*] appeared in numbers about the same time. The spread of the cotton boll weevil [*Anthonomus grandis*] into North Carolina is recorded.

SANBORN (C. E.). **Report of the Entomological Department.**—*28th Ann. Rept. Oklahoma Agric. Expt. Sta., 1918–19, Stillwater,* 1919, pp. 40–44. [Received 6th January 1921.]

Experiments with the cowpea Bruchid [*Bruchus quadrimaculatus*] show that there are seven generations and a partial eighth in Oklahoma. The storing of cow-peas under lime and fumigating with carbon bisulphide are the measures recommended [*R.A.E.*, A, viii, 185].

HALL (R. R.) & BOVELL (J. R.). **Report on the Sugar-cane Experiments for the Season 1918-1920.**—*Dept. Agric., Barbados,* 1920, 77 pp. [Received 6th January 1921.]

Results of manurial experiments on sugar-cane plots were again so conflicting, owing to the presence of *Diaprepes abbreviatus,* L. (root borer) and *Lachnosterna* (*Phytalus*) *smithi,* Arr. (brown hard-back), that it is impossible to draw any conclusions from them. During 1916, 2,305 of these beetles were captured, 5,962 in 1918, and 7,577 in 1920. In spite of the stumps having been dug up and the insects killed, their numbers have therefore gradually increased.

A table records collections of various stages of *D. abbreviatus* and *L. smithi* on a given area over a period of 18 months. The numbers collected on different plots varied considerably. It is remarked that as the dry season sets in the larvae of these two species burrow down to the damp substrata, and during the exceptionally dry season under review it is probable that many burrowed below the depth of one foot to which the old cane holes were dug. They have been found as much as three feet below the surface.

PARROTT (P. J.) & OLMSTEAD (R. D.). **The Leafhopper as a Potato Pest.**—*New York Agric. Expt. Sta., Geneva, N.Y.,* Tech. Bull. 77, March 1920, 18 pp., 5 plates. [Received 6th January 1921.]

The leafhopper, *Empoasca mali,* Le B., which has been noticed chiefly as a pest of apples, has recently caused considerable trouble as a potato pest. Migration of over-wintering leafhoppers to potato plants began in early June, oviposition occurring on the young plants as soon as they appeared above ground, and continuing until the plants were killed by frost in early October. The insects reached their maximum numbers during late July, and again in late August and early September, when adults of the second generation were most abundant. Infestation was severest from 15th August to 15th September, nymphs and adults of the first and second generations then intermingling. As a result of the punctures of the insects, small brownish areas appeared at the tips and sometimes on the margins of the leaflets. These areas gradually increased in size and number until the leaf margins rolled upward, leaving only a small green area in the middle of the leaflet.

Experiments were conducted to test the effect of various mixtures on the leafhoppers, including Bordeaux mixture, Bordeaux with lime and with lead arsenate, and china clay with soap. The results, recorded in tables, show that all of the spraying mixtures gave considerable protection from the adults. The heavy washes of china clay or lime proved somewhat better repellents than the other spraying mixtures. The china clay, however, was easily washed off by rain, while lime, applied in the amounts specified, caused injury to the foliage. It is possible that smaller amounts of lime might give the desired effect without injury.

GREEN (A. W.). **Grass-grub Control. Experience at Ruakura.**—*N.Z. Jl. Agric., Wellington,* xxi, no. 4, 20th October 1920, pp. 174–175.

Odontria zealandica (grass grub) has been successfully controlled in New Zealand by concentrating cattle on the infested area, the grubs being killed by the trampling of the animals. This method is advocated when the infestation is confined to small areas.

ZACHER (F.). **Beiträge zur Kenntnis der westafrikanischen Pflanzenschädlinge.** [Contributions to the Knowledge of West African Plant Pests.]—*Tropenpflanzer, Berlin,* xviii, nos. 9–10, October 1915, pp. 504–534, 35 figs. [Received 6th January 1921.]

This paper contains a list of 82 injurious insects from Togoland, the injury being described in each case. Peacock's paper on pests in South Nigeria [*R.A.E.*, A, ii, 106] is referred to at length. The species of *Sylepta* recorded from the timber tree, *Monotes kerstingi* [*R.A.E.*, i, 350] is closely allied to *S. inanitalis,* Led.

A description is given of *Thaumatotibia roerigii,* gen. et sp. n.—the Togo bollworm of cotton.

Pests from Kamerun comprised:—A Bostrychid pest of *Hevea, Xylopertha picea,* Ol., on which a Clerid, *Cylidrus fasciatus,* Ol., and a Histerid, *Teretriosoma saginatum,* are predaceous; *Gonocephalum* (*Opatrum*) *simplex,* F., on tobacco; *Stenotarsus guineensis,* Gerst., on *Hibiscus*; and *Myllocerus amoenus,* Hartm., of which the description is given. This last beetle also occurs in Fernando Po.

The Lepidopterous pests of cacao in South Kamerun are *Leipoxais peraffinis,* Holl., *Nudaurelia dione,* F., and *Euchromia lethe,* F. The caterpillars of *Prolatoia sjöstedti,* Aur., are recorded on *Manihot utilissima,* of which plant no pests had previously been known from Africa. *Diacrisia rava* is common on palms.

MOLL (—). **Der Schutz des Bauholzes in den Tropen gegen die Zerstörung durch die Termiten.** [The Protection of constructional Timber in the Tropics against Destruction by Termites.]—*Tropenpflanzer, Berlin,* xviii, no. 11, November 1915, pp. 591–605, 10 figs. [Received 6th January 1921.]

Information is given on the kinds of wood that resist the attack of termites, and on commercial methods for impregnating woods with tar-oil, or with arsenic mixed either with mercury perchloride or the Wollmann mixture used in German mines.

ROSENBERG (L.). **Die Heuschrecken in Palästina.** [Locusts in Palestine.]—*Tropenpflanzer, Berlin,* xviii, no. 12, December 1915, pp. 657–669, 3 figs. [Received 6th January 1921.]

The serious outbreak of locusts in Palestine in 1915 is described. The Jewish settlements suffered a loss of about £120,000. Among the measures adopted was the use of a flour paste placed on the ground, locusts coming into contact with it being suffocated owing to its sealing their stigmata. In a more fluid form this paste can be applied to tree-trunks.

MORSTATT (H.). **Pflanzenkrankheiten in den Tropen.** [Plant Diseases in the Tropics.]—*Tropenpflanzer, Berlin,* xxiii, no. 4, April 1920, pp. 114–117. [Received 6th January 1921.]

The remarkable injury that is sometimes done to crops in the tropics is due to the fact that their cultivation is a new departure. Such a disaster as the destruction of coffee [by *Hemileia vastatrix*] in Ceylon cannot be ascribed to dangers peculiar to tropical conditions. Fungi always accompany plants, but in the case of insects it is feasible to prevent the importation of a given species with a known life-history, but it is not possible to predict what enemies a plant will find in its new home, and what their effect on it will be.

FRIEDERICHS (K.). **Weberameisen und Pflanzenschutz.** [Weaver Ants and Plant Protection.]—*Tropenpflanzer, Berlin,* xxiii no. 5–6, May–June 1920, pp. 142–150. [Received 6th January 1921.]

This paper is published in view of an Ordinance issued at Rabaul (New Guinea) on 26th August 1919, respecting the palm leaf beetles, *Promecotheca antiqua* and *P. opacicollis*. These Hispids cannot be classed among the more dangerous pests of coconut, as their infestation is very local, and most of the larvae are parasitised by Chalcids, as has also been recorded by Knowles and Jepson in Fiji. In Samoa the author recommended arsenical sprays, and the above Ordinance also advises arsenicals, and the removal and destruction of the leaflets containing larval mines. All these measures are considered unnecessary, however, owing to the extent of parasitism. If the parasites are absent, they can be introduced.

An interesting feature of the Ordinance is the recommendation to employ the red tree ant (called "karakum" by the natives) by establishing large numbers in the plantations. This can only refer to weaver ants of the genus *Oecophylla*.

Many travellers in eastern Asia have reported the use of ants against plant pests. Escherich states that as far back as the 12th century this was the case in China, where a special class of workers existed for this purpose. Raciborski mentions that nests of large red ants are tied in mango trees in Java to protect the fruits against *Sternochetus* (*Cryptorrhynchus*) *mangiferae*.

When, early in 1914, the author was studying *Oryctes rhinoceros* (rhinoceros beetle) in Cochin China and Cambodia, he found that the presence of ants, of which *Oecophylla smaragdina* was the commonest, did ensure the absence of many insect pests, though leaf-eating Lamellicorn beetles are not interfered with, as they feed at night.

In New Guinea, where the weaver ants are indigenous, there is no reason to oppose their removal to places where they are needed against *Promecotheca*, but proposals to establish them in the more distant South Sea Islands, and other regions where they do not occur should not be entertained, on account of their habit of tending Aphids and Coccids.

Other leaf-sewing ants that have been observed in Cochin China are *Polyrhachis thrinax*, Rog., var. *javana*, Mayr, and *Dolichoderus taprobanae*, Sur., var. *friederichsi*, Forel.

According to Forel, *Oecophylla smaragdina virescens* occurs in Australia and New Guinea: and many forms of this ant are known in Africa.

Friederichs (K.). **Bericht über den staatlichen Pflanzenschutzdienst in Deutsch-Samoa, 1912-1914.** [Report on the Government Plant Protection Service in German Samoa in 1912–1914.] —*Beiheft zum Tropenpflanzer, Berlin*, xviii, no. 5, August 1918, pp. 257–294. [Received 6th January 1921.]

The contents of this report are indicated by its title.

Morstatt (H.). **Die Herzfäule der Kokospalmen, eine pflanzenpathologische Studie.** [The Bud Rot of Coconut Palms: A Study in Plant Pathology.]—*Beiheft zum Tropenpflanzer, Berlin*, xx, no. 3, May–June 1920, pp. 71–124.

Typical coconut bud-rot is due to the attack of healthy uninjured palms by a bacillus that is favoured by soil conditions and injury due to insects, and is probably spread by the latter.

Secondary bud-rot depends entirely on a previous disease or injury, without which it cannot occur. The relation between it and fungus infestation is not yet sufficiently clear, but definite information exists on the point of insect injury. The latter is chiefly due to the rhinoceros beetle [*Oryctes rhinoceros*], which sometimes enables the palm weevil [*Rhynchophorus*] to enter, but more often prepares the way for bud-rot. In East Africa there is a primary, independent bud-rot, and a secondary form due to *Oryctes*; in Samoa the secondary form due to *Oryctes* is the only one found; in Ceylon primary bud-rot and infestation by *Oryctes* are found, but secondary bud-rot does not occur.

Burkhardt (F.). **Erfahrungen mit dem Chlorpikrin als Mittel zur Bekämpfung tierischer Schädlinge.** [Experiences with Chloropicrin as a Means for combating Animal Pests.]—*Deutsche landw. Presse*, xlvii, 1920, p. 417. (Abstract in *Centralbl. Bakt., Parasit. u. Infektionskr., Jena*, IIte Abt., lii, no. 16–17, 20th December 1920, pp. 387–388.)

Chloropicrin is a useful insecticide against *Calandra granaria*, moths, and flies, in cases where only a small quantity of material has to be disinfected, or the receptacles can be hermetically sealed. Under these conditions a strength of 4 grams per cu. metre rapidly kills the weevils.

SCHRODER (C.) & others. **Handbuch der Entomologie.**—Gustav Fischer, *Jena*. (Review in *Centralbl. Bakt., Parasit. u. Infektionkr., Jena*, IIte Abt., lii, no. 16–17, 20th December 1920, p. 388.)

This work, which is being issued in four volumes, is being published in response to the demand in Germany for an extensive text book.

SCHMITT (C.). **Insekten als Blattminierer.** [Insects as Leafminers.] —*Naturw. Wochenschr.*, N.S. xvii, 1918, pp. 721–724. (Abstract in *Centralbl. Bakt., Parasit. u. Infektionkr., Jena*, IIte Abt., lii, no. 16–17, 20th December 1920, p. 390.)

Leaf-mines may be divided into gallery-mines and blister-mines. In the latter the epidermis is raised as an almost transparent membrane. The author made contact prints direct from the leaves, in order to obtain illustrations of the following mines, details of which are discussed:—Lepidoptera: *Lyonetia clerkella* on cherry; *Bucculatrix fangulella* on buckthorn; *Nepticula centifoliella* on roses; *Tischeria complanella* on oak; *Phyllorycter* (*Lithocolletis*) *quercifoliella* on *Quercus pedunculata*; *P.* (*L.*) *comparella* on *Populus alba*; Coleoptera: *Rhynchaenus* (*Orchestes*) *fagi* on *Fagus sylvatica*; Diptera: *Phytomyza nigra* on *Lappa*.

ZIMMERMANN (H.). **Ueber die Erdraupen der Wintersaateule** (*Agrotis segetum*, **Schiff**.). **Erdraupenschäden in Mecklenburg in 1912–1917.** [The Caterpillars of *Euxoa segetum* and their Injury in Mecklenburg in 1912–1917.]—*Arch. Ver. Freunde Naturgesch. in Mecklenburg*, lxxiii, 1919, pp. 25–54. (Abstract in *Centralbl. Bakt., Parasit. u. Infektionskr., Jena*, IIte Abt., lii, no. 16–17, 20th December 1920, pp. 394–395.]

The information given here is substantially the same as in a paper already noticed [*R. A.E.*, A, vi, 444].

ZIMMERMANN (H.). **Ueber die Erdraupe der Wintersaateule. Ein weiterer Beitrag zu der Lebensweise und Bekämpfung.** [The Caterpillar of *Euxoa segetum*. A further Contribution regards its Life-history and Control.]—*Mecklenburg. Landwirtschaftl. Wochenschr.*, iv, 1920, pp. 184–188. (Abstract in *Centralbl. Bakt., Parasit. u. Infektionskr., Jena*, IIte Abt., lii, no. 16–17, 20th December 1920, p. 395.)

These observations on *Euxoa segetum*, made in Mecklenburg in 1918 and 1919, continue those already recorded [*R. A.E.*, A, vi, 444]. They confirm the assumption that weather is a dominant factor as regards this moth [*R. A.E.*, A, ix, 63]. In 1918 cold weather prevailed from the end of May up to mid-July, while continuous wet weather prevailed from the end of July up to September. These conditions proved unfavourable to the pest. Hibernation is more common in the larval stage than in the pupal one, and this accounts for the occasional spring injury to winter corn. In 1918 caterpillars and adults appeared from the beginning of April up to 19th July, but not later. Besides the appearance in winter corn of caterpillars that had not completed their development in 1917, only one case

of injury was observed in summer corn. On turnips and swedes the infestation was less extensive than in 1917. Potatoes suffered little, and carrots and winter rape were uninjured. In 1919 the infestation was of even less importance.

ADLER (S.). **Lebensweise und Fortpflanzung des Schmarotzers der Kohlweisslingsraupe,** *Apanteles glomeratus,* **L.** [The Life-history and Reproduction of the Cabbage Butterfly Parasite, *A. glomeratus.*]—*Aus. d. Natur,* xvi, 1920, pp. 236–243. (Abstract in *Centralbl. Bakt., Parasit. u. Infektionskr., Jena,* IIte Abt., lii, no. 16–17, 20th December 1920, pp. 396–397.)

Much of the information here given has already been noticed from a previous paper [*R.A.E.*, A, ix, 37]. *Apanteles glomeratus* only attacks the young caterpillars of *Pieris brassicae* when they are still feeding on the egg-shells. As soon as they begin to feed on the cabbage leaf they are able to eject some of the green plant juice at the Braconid, causing it to desist and to crawl about the leaf endeavouring to cleanse itself. The egg-stage of the butterfly lasts 8–9 days in summer; this period can be prolonged in a cold room. The same applies to the cocoons of *A. glomeratus,* which otherwise require 6–8 days to develop. There is, therefore, a reciprocal adaptation to temperature.

TURINETTI (L.). **La Lutte contre la Mouche des Olives** (*Dacus oleae*) **en Italie.** [The Campaign against the Olive Fly (*Dacus oleae*) in Italy.]—*Progrès Agric. & Vitic., Montpellier,* lxxv, no. 1, 2nd January 1921, pp. 23–27.

It is suggested that in the olive groves along the Mediterranean coast south of Pisa, where *Dacus oleae* has been unusually abundant, resulting in a heavy loss to the olive crop, the Berlese remedies might be used with much success [*R.A.E.*, A, ii, 452; iii, 36; iv, 159, etc.]. Experiments in this district indicate that a first spray of molasses and sodium arsenite should be applied from 1st to 10th July against the first generation, and from 10th to 20th August against the second generation. Where practicable the bait method might also be used. These remedies promise equal success in the French Riviera to that obtained in Italy, where conditions differ considerably, but their use will necessitate the removal of the prohibition against the use of soluble arsenical salts that is still in force in France.

HOWARD (L. O.). **Report [1919-1920] of the Entomologist.**—*U.S. Dept. Agric., Bur. Ent., Washington, D.C.,* 7th September 1920, 36 pp. [Received 7th January 1921.]

Since the last report [*R.A.E.*, A, viii, 93] many fresh areas of infestation by the European corn borer [*Pyrausta nubilalis*] have been recorded, adding many hundreds of square miles to the previously known area, some of them evidently being infestations of several years' standing. Flight experiments for determining the possible rate of the natural spread of this moth have shown a maximum flight of 1,300 yds. Egg-clusters have been found on several crops other than maize, such as beet, rhubarb, celery, lettuce and several wild plants. In eastern Massachusetts the larvae have been observed to feed upon cotton to some extent. Some study has been made in the south of France and in Italy of the parasites of *P. nubilalis,* three having been found in France and four in Italy.

Grasshopper outbreaks were heavy and injurious, especially in North Dakota and the Canadian border, the chief species being *Melanoplus atlantis* and *Camnula pellucida*. There were, unfortunately no funds to meet the sudden requirements for poison-bait and labour, and attention is drawn to the great desirability of a reserve fund to meet similar emergencies in the future. A method of spraying for the alfalfa weevil [*Hypera variabilis*] has been devised that promises much success; this will be described in a bulletin to appear shortly. Chinch bugs [*Blissus leucopterus*] were more than usually injurious in Missouri, Illinois and other middle-western States. These regions also suffered from outbreaks of the true army worm [*Cirphis unipuncta*]. Excellent results were obtained wherever the poison bait and ditch barrier methods were used promptly and intelligently.

Among stored products it is estimated that as a result of inspection and advice by experts, supplies of rice and beans were saved worth about twenty-seven times the appropriation for this project. Processes described in last year's report [*loc. cit.*, 94] for preventing losses among stored goods have been continued; a commercial machine for sterilising cartons of cereals by electricity promises to give good results. Among household pests a special study has been made of the black carpet beetle [*Attagenus piceus*].

Deciduous fruit insect investigations included a study of the Japanese beetle [*Popillia japonica*] [*R.A.E.*, A, viii, 307, etc.]. This beetle has proved to be almost omnivorous. Its special distribution covers about 50 square miles. To restrict it an attempt is being made to maintain a barrier of dusted or sprayed foliage about a mile wide completely round the infested area. In spite of this, the indications are that the beetle will continue to spread. Its natural enemies occurring in Japan are being studied, and it is hoped that some of these may be established in New Jersey. One shipment of a predatory beetle has already been received. Peaches in Georgia have been very severely damaged by the plum curculio [*Conotrachelus nenuphar*], which has caused losses estimated at about £400,000. Observations indicate that under conditions of abundant rain and high temperature this weevil may develop a partial second generation of larvae, which infests the ripening fruit. Work on the codling moth [*Cydia pomonella*] has been continued on the same lines as last year [*loc. cit.*, 94]. The spray gun gives the best results in insecticidal treatments. As many moths have been known to emerge in the packing sheds, baskets used in handling the crop of 1919 were kept through the winter in closed buildings. An attempt is being made to introduce parasites of *C. pomonella*, and tests are being made with a dust composed of a fungicide, lead arsenate and tobacco extract, to be used simultaneously against fungous diseases, biting insects and sucking insects. Further investigations have been made on the grape-berry moth [*Polychrosis viteana*] in Ohio; where infestation is not too severe, one treatment with lead arsenate should be sufficient. In parts of Michigan considerable damage has been done to grapes by the grape root worm [*Fidia viticida*] and an Aphid, which have hitherto been considered unimportant pests. The treatment with sulphur fumes for the grape mealybug [*Pseudococcus bakeri*], advocated in last year's report, has proved to be impracticable, and other methods are being investigated. The white-lined sphinx moth [*Celerio lineata*] and the grape sphinx moth [*Pholus achemon*] were both troublesome; for the former no satisfactory sprays were found, and hand-collection was

resorted to; for the latter a dust of 3 parts sulphur to 1 part lead arsenate proved effective.

Experiments with pecan insects have shown that the pecan-leaf case-bearer [*Acrobasis nebulella*] should be treated with liquid lead arsenate rather than dust or calcium arsenate. For the obscure scale [*Chrysomphalus obscurus*] on pecan, crude oil emulsion or lime-sulphur solution in winter strength should be applied during early spring, before the buds are out. Against the pecan weevil [*Balaninus caryae*] spraying and dusting experiments were unsuccessful. Fumigation of harvested nuts with carbon bisulphide, using $\frac{1}{2}$ oz. per bushel of nuts, and fumigating for 24 hours, proved effective. This method, however, is only partially successful, since a considerable portion of the larvae in some regions leave the pecans before harvest time. The walnut husk maggot, which was originally a pest of black walnuts only, is now attacking Persian and Japanese walnuts in the eastern part of the country. The maggots mine through the husk, causing the nuts either to drop prematurely or to adhere to the branches beyond the regular harvest time. Investigations on this insect will be published shortly. Several species of walnut and hickory curculios are also being studied; these attack the immature nuts, causing many of them to fall. *Conotrachelus retentus* oviposits in black walnuts that are about one-fourth grown, from 50 to 90 per cent. being infested in some localities. Other weevils attacking chestnut and hazel are also being studied.

Investigations of miscellaneous insecticides have been continued. From experiments on thousands of insects, it appears that the percentage of water-soluble arsenic in arsenicals before they are taken in by insects has little to do with their toxicity, although those in which the arsenic content is nearly all water-soluble generally give the highest rate of toxicity. The higher the percentage of arsenic rendered soluble inside the bodies of insects, the higher, as a rule, is the rate of toxicity, and the more arsenic retained in the insects as compared with that voided, the higher is the rate of toxicity. It is evident that only an indefinite opinion concerning the killing power of an arsenical can be inferred from its composition, but results indicate that the toxicity depends directly upon the amount of arsenic rendered soluble inside the insects, and this solubility depends directly upon the stability of the compound.

Vegetable pests include the sweet potato weevil [*Cylas formicarius*], but clean cultivation and co-operation among farmers and the planting of uninfested potatoes have produced a great decrease in infestation. Alabama, where 30 farms were infested, can now be declared free from the pest. A weevil-free zone 30 miles in length is being maintained on the eastern coast of Florida through the destruction of the food-plant, morning glory [*Ipomaea*], and the only infested plot of this plant on the mainland of Mississippi has also been destroyed. The Colorado potato beetle [*Leptinotarsa decemlineata*] has been scarce in Maryland and Virginia, doubtless owing to late spraying, parasites and severe winters. Against the potato leafhopper [*Empoasca mali*] Bordeaux mixture proved a satisfactory repellent, while nicotine sulphate and kerosene emulsion were ineffective. The tarnished plant bug [*Lygus pratensis*] severely injured potatoes in some localities; its wild food-plants and breeding-places are being studied. The bean ladybird [*Epilachna corrupta*] has been troublesome in Colorado and New Mexico, except where thorough spraying

has been practised. An unprecedented outbreak of the green clover worm [*Plathypena scabra*] over the Eastern States has caused the defoliation of all varieties of beans, but arsenicals were found to be an effective remedy. For the striped cucumber beetle [*Diabrotica vittata*] Bordeaux-lead arsenate mixture combined with other measures has proved an effective check. Work on the sugar-beet leafhopper [*Eutettix tenella*] is being continued. It has been found that an alternation of food-plants, involving at least two wild species, occurs between the production of the disease of curly-top on beets and reinoculation. Studies are being made of 350 types of resistant beets.

It is estimated that the damage by insects to forest and shade trees and their products amounts to more than £20,000,000 annually. There has been no conspicuous increase in the more destructive insects, except that of the spruce budworm [*Tortrix fumiferana*] in northern New England, which has been a menace to the paper industry, and a defoliating caterpillar on Texas pines. An outbreak of the southern pine beetle [*Dendroctonus frontalis*] was threatened. The western pine beetle [*Dendroctonus brevicomis*] was studied in Oregon. Figures are given proving the value of remedial measures. Some 130,000 acres in California were treated in 1920, and this will be continued over a period of five years. The application of the Craighead solar heat principle of control [*R.A.E.*, A, viii, 365] against the western pine beetle has shown that a maximum daily tempearture as low as 75° F. during a few clear days will kill the beetles in infested bark removed from the trees and exposed to the direct rays of the sun. Experiment has shown that if mesquite, in southern Arizona, is cut for cordwood, posts, etc., between 15th October and 15th January, and piled in open ricks, little or no damage will be done by insects. If cut in the spring and summer, as is usual, the wood is often reduced to dust before the end of summer. The solar heat system was used with success; the posts, when cut, were put out in the sun and turned occasionally until the bark was thoroughly dried. This kills the insects already in the wood, and the dry bark is not attacked by insects destructive to the wood. This makes it practicable to cut the trees at any time during the summer. The optimum times for cutting various trees to avoid insect attack have been worked out. Recent studies have shown that Hopkins' bioclimatic law [*R.A.E.*, A, viii, 87] applies to the continental areas of the northern and southern hemispheres, and much attention has been given to applying this law to agricultural research and economic practice.

The increase in the area infested with gipsy moth [*Porthetria dispar*] during the year amounts to 4,569 square miles; these were added to the previous quarantine area, which now covers 25,316 square miles. In many old sites the pest seems to have been exterminated. The area under quarantine for brown-tail moth [*Nygmia phaeorrhoea*] has been reduced by 10,677 square miles. Spraying and banding operations for these pests are described. Parasitism by the enemies discussed in the previous report has steadily increased in the case of *P. dispar*, but those of *N. phaeorrhoea* were less numerous, largely owing to the occurrence of a fungous disease. New areas of infestation by *P. dispar* in New Jersey and New York threaten a further wide distribution, unless prompt measures are taken and adequate funds are made available.

With regard to southern crop pests, the use of calcium arsenate against the cotton boll-weevil [*Anthonomus grandis*] has been greatly

extended. Suitable dusting machinery by wheel-traction power has now been devised, motor power dusters proving unsuitable. The tobacco hornworm [*Protoparce*] can be best dealt with by dusting machinery, and, owing to labour shortage, one application of twice the usual amount of lead arsenate was sometimes more economical than two smaller ones, and produced good results. Calcium arsenate is not recommended for tobacco. It is hoped to reduce the hibernating hornworms by means of insecticides applied to the suckers, which often grow a great deal after the tobacco crop is housed. On shade tobacco in Florida, experiments are being made with a mixture of lead arsenate and tobacco dust, lead arsenate alone, Paris green and calcium arsenate all being dangerous. The introduction of parasites from Cuba of the sugar-cane moth borer [*Diatraea saccharalis crambidoides*] has continued on a much larger scale, and it will now be possible to decide whether they can survive the Louisiana winter. They are at present the most promising means of control. The destruction of old maize stalks, in which the larvae can spend the winter, is strongly advocated. As several new areas of infestation have been discovered, a general survey of infested territory is to be made.

A brief outline is given of work carried out in connection with pests of *Citrus* fruits in California and Florida; insects affecting mango, guava, avocado and other sub-tropical fruits; greenhouse insects, including the strawberry root worm [*Typophorus canellus*], which has developed into a serious pest of roses grown under glass; Mediterranean fruit fly [*Ceratitis capitata*] and melon fly [*Dacus cucurbitae*]; pests of the algaroba bean; fruit-flies and other fruit pests in the Canal Zone, Panama; and the camphor thrips [*Cryptothrips floridensis*]. The outlook of the bee industry, which is growing in extent and importance, and the lines of work to be followed in this connection, are discussed.

NEWCOMER (E. J.). U.S. Bur. Ent. **Winter Killing of Codling Moth Larvae.**—*Jl. Econ. Ent., Concord, N.H.*, xiii, no. 6, December 1920, pp. 441–442.

Observations made in the arid section of Washington State show that, with a minimum temperature ranging from –20° to –25° F. during the winter, about 80 to 90 per cent. of the codling moth larvae are killed. Wherever the temperature had been below –25° F., all larvae protected only by bark or burlap bands were killed. The effect of similar temperatures in more humid regions has not been ascertained.

SPULER (A.). **Winter Killing of the San José Scale.**—*Jl. Econ. Ent., Concord, N.H.*, xiii, no. 6, December 1920, pp. 443–444.

Records made in various localities show that the percentage of larvae of the San José scale [*Aspidiotus perniciosus*] killed by cold during the winter of 1919–20 exceeded the average of the previous ten years.

VICKERY (R. K.). **Petroleum Insecticides.**—*Jl. Econ. Ent., Concord, N.H.*, xiii, no. 6, December 1920, pp. 444–447.

In view of the scarcity of petroleum and its resulting high cost, the discovery of an equally efficient insecticide is of great importance.

It is suggested that a knowledge of the chemistry of petroleum may make it possible to find compounds that are fatal to insects and not injurious to plants. In addition to these properties, an ideal contact insecticide should keep well and be applicable either in liquid or dust form.

Newell (W.). **Presidential Letter.**—*Jl. Econ. Ent., Concord, N.H.*, xiii, no. 6, December 1920, pp. 447–449.

Complaints are often made as to the inadequate remuneration of entomologists compared to the value of their services. The importance of this profession to agricultural production has not yet been fully realised by the public. It is within the power of the economic entomologist to make his services indispensable by inaugurating, executing, and completing projects of magnitude that either prevent enormous losses from injurious insects or make the recurrence of such losses impossible. Too few efforts at eradication in the entomological field have been made in the past, whereas too much stress has been laid on measures that are merely palliatives.

Pierce (W. D.). **Commercial Entomology and the Service it can render to organised Agriculture.**—*Jl. Econ. Ent., Concord, N.H.*, xiii, no. 6, December 1920, pp. 449–456.

The only valid reason for the existence of any profession is the service it can render to humanity. Entomologists have it in their power to reduce agricultural losses by the application of their knowledge to the eradication of the many existing insect pests. This can only be done on a large scale by a business organisation. The control of widespread pests is no longer a function of the Government, but that of private enterprise, in which the Government may assume the rôle of adviser. The ever-increasing need for commercial entomology to fight insects and disease from a business standpoint is emphasised. Co-operative action of growers is also essential, as practically any insect can bridge the gaps and barriers that separate treated from untreated fields.

Melander (A. L.). **An Index Number for Rating Codling Moth Treatments.**—*Jl. Econ. Ent., Concord, N.H.*, xiii, no. 6, December 1920, pp. 456–458.

The larvae of the codling moth [*Cydia pomonella*] that die on their way into an apple generally produce a characteristic sting. It is suggested that the ratio of caterpillars to stings affords a more dependable index of the value of various sprays than the customary percentage of final infestation. This method cannot be applied to the calyx spray. As the effects of repellent additions to the spray or of thickened apple skin may interfere with the validity of the index number, their range should be investigated.

Rixford (G. P.). **Symbiosis of *Blastophaga* and the Fig Family.**—*Jl. Econ. Ent., Concord, N.H.*, xiii, no. 6, December 1920, pp. 459–463.

Blastophaga oviposits in the winter crop of the caprifig, which forms in the autumn on the wood of the current season. The larvae

hibernate in the fruits, and can withstand a temperature of 14° or 15° F. The insects develop rapidly with the advent of warm weather, and emerge from the fruit in April, when the spring crop is in a receptive condition. The summer crop carries the insect through the late summer and autumn months until it is ready for oviposition in the winter crop. Various species of figs are discussed, and their dependence on *B. psenes* for pollination is described. This Chalcid is therefore extremely beneficial in California, where the fig crop is becoming a very important one.

Ferris (G. F.). **Insects of Economic Importance in the Cape Region of Lower California, Mexico.**—*Jl. Econ. Ent., Concord, N.H.*, xiii, no. 6, December 1920, pp. 463–467.

The insects recorded in the above region during 1919 include *Blissus occiduus*, Barber, the Tingid *Leptodictya tabida*, H. S., and the Delphacid *Peregrinus maidis*, Ashm., on sugar-cane and maize; *Trichobaris mucorea*, Lec., on tobacco; *Chrysomphalus aurantii*, Mask., and *Lepidosaphes gloveri*, Pack., on *Citrus*; *Aspidiotus lataniae*, Sign., and an apparently native species of *Asterolecanium*, as well as a thrips, *Heliothrips haemorrhoidalis*, Bch., on mango; *Saissetia oleae*, Bern., on wild food-plants; *Pseudococcus citri*, Risso, on mango; *Asterolecanium pustulans*, Ckll., on oleander; *Aspidiotus diffinis*, Newst., on guava; *Pseudoparlatoria parlatorioides*, Comst., on guava and avocado; *Pseudococcus maritimus*, Ehrh., on wild food-plants; an undetermined species, probably *Icerya rileyi*, Ckll., on numerous food-plants; *Aphis illinoisensis*, Shim., on grape; and the Tingid *Corythuca gossypii*, F., on castor bean.

The isolation of the country and the small amount of traffic between this and other districts probably accounts for the small number of pests discovered.

Maxson (A. C.). **Combating the Sugar Beet Webworm on a large Scale.**—*Jl. Econ. Ent., Concord, N.H.*, xiii, no. 6, December 1920, pp. 468–471.

Loxostege sticticalis, L. (sugar beet webworm) was particularly abundant during 1919 in the Rocky Mountain States. The first brood covered 172,728 acres in June, and the second 7,567 acres in July to August. The campaign against this moth covered a portion of four States, and was organised by the Great Western Sugar Company. The methods employed are described. As it could not be foreseen that the outbreak under review would cover an area five times as large as that infested in 1918, the preliminary preparations proved inadequate, and additional sprayers and insecticides had to be purchased after the campaign had begun. Owing to the ultimate success obtained, several more sprayers and new insecticides have been procured for experimental purposes. Of the substances used in 1919, Paris green, at the rate of $3\frac{1}{2}$ to 4 lb. per acre, gave by far the quickest and best results, at an inclusive cost of about 14s. 6d. A timely and successful application of insecticide would mean an average profit of over 400 per cent. on the investment.

Herbert (F. B.). U.S. Bur. Ent. **Results of Washing Experiments for Control of the European Elm Scale.**—*Jl. Econ. Ent., Concord, N.H.*, xiii, no. 6, December 1920, pp. 471–475.

Gossyparia spuria, Mod. (European elm scale) may be satisfactorily controlled on small trees by washing with a garden hose and nozzle, and an average force of water. During experiments at San José, California, large trees were successfully treated by means of a steam fire-engine and water from the large city mains, producing a pressure of from 100 to 160 lb. to the square inch. An ordinary orchard spray outfit is advocated for trees up to 35 or 40 ft. high. This method is slightly more expensive than washing, but it will probably be more satisfactory. The best time for such operations is just before the leaves unfold. At San José this was about 17th to 25th April in 1918.

Woglum (R. S.) & Rounds (M. B.). U.S. Bur. Ent. **Daylight Orchard Fumigation.**—*Jl. Econ. Ent., Concord, N.H.*, xiii, no. 6, December 1920, pp. 476–485.

Further trials have been made to determine the possibility of successful daylight fumigation with liquid hydrocyanic acid gas for the control of scale-insects [*R.A.E.*, A, vii, 288; viii, 29]. The most suitable material to use for fumigation tents and the relative temperatures under light and dark coloured tents are discussed, and tables show the comparative results of night and daylight fumigation on the black scale [*Saissetia nigra*], and of the relative mortality in different parts of a tree fumigated in the sunshine.

Sunshine coming into contact with plants immediately after fumigation, and before they have fully recovered their normal physiological activity, is one of the most important factors as regards injury to the tree. The strength of gas, the length of exposure and the temperature or intensity of the sunshine are all considerations that form the basis of daylight fumigation procedure. Injury from daylight fumigation is characterised by dropping of the leaves, particularly on the sunny side of the tree, and in severe cases by bleaching of green fruit. It is noticed that lemons seem to be far less susceptible to sunshine fumigation than oranges.

As a result of experimental daylight fumigation carried on from the middle of the active fumigation season in October throughout the winter period, the authors are convinced that, where practicable, daylight winter fumigation is preferable to night work. At this period the scales are particularly difficult to kill on cool nights. Moreover the trees are in a dormant condition and can withstand a stronger gas, even at temperatures approximating 80° F. Particular attention should be given to the exposure. It is not considered, however, that the daylight practice can be recommended to supersede night work, except in the case of experienced and careful operators who can constantly manipulate the dosage and exposure. Fixed doses and exposures are the safest, but the necessary data have not yet been accumulated to establish these; in fact, they will be difficult, if not impossible, to establish in the extreme varieties of daylight weather during the usual fumigating season, and in view of the widely differing conditions between the hot interior valleys and the cooler, more humid coastal belt.

Hinds (W. E.). **Mexican Bean Beetle Situation.**—*Jl. Econ. Ent., Concord, N.H.*, xiii, no. 6, December 1920, pp. 486–488.

Attention is drawn to the seriousness of the present position and the danger of the further spread of *Epilachna corrupta*, Muls., in the United States. There is apparently no geographical or climatic barrier for this pest. At present the infestation in Alabama covers more than 4,500 square miles. The food-plants include various kinds of beans, with the exception of velvet beans, although these were accepted as food under laboratory conditions. In Alabama breeding is continuous until the frosts begin ; there are apparently three to four generations a year. All remedial measures so far tried have proved ineffective. Arsenicals may act as repellents, but cannot save the crop. This beetle is very hardy, and survived a submersion in water of 24 hours, although 48 hours proved fatal to all individuals. Even fumigation with hydrocyanic gas at standard strength only killed 25 per cent. of the adults tested.

The Alabama State Board of Horticulture has established a quarantine covering the known infested area and an adjoining safety zone of approximately 25 miles and prohibiting the movement of all possible food-plants and materials likely to disseminate the pest.

The country of origin of this beetle appears to be Mexico, and diligent search there may reveal the existence of useful parasites.

Thomas (F. L.). **A Study of the Effect of Cotton Worm on Boll Development and Cotton Yield.**—*Jl. Econ. Ent., Concord, N.H.*, xiii, no. 6, December 1920, pp. 489–491.

As a result of observations made during 1919 in Alabama it was found that injury to foliage by the cotton worm [*Alabama argillacea*] does not kill the plants or cause loss of weight in the bolls, but the unopened bolls mature much earlier under boll-weevil conditions, and in years of abundant moisture the stripping of rank-growing cotton two months before a killing frost is considered beneficial rather than injurious.

Smith (R. C.). **Predaceous Grasshoppers.**—*Jl. Econ. Ent., Concord, N.H.*, xiii, no. 6, December 1920, p. 491.

The grasshopper, *Udeopsylla nigra*, Scud., is recorded as predaceous on adults of *Lachnosterna*. In captivity it readily feeds on many beetles as well as on other grasshoppers.

Moznette (G. F.). **A Blossom-destroying Beetle on the Mango and Avocado.**—*Jl. Econ. Ent., Concord, N.H.*, xiii, no. 6, December 1920, p. 491.

Considerable damage was caused by a Rutelid beetle, *Anomala undulata*, Mels., to avocado and mango trees in southern Florida during the spring of 1920, the damage being done at night to the bloom spikes.

Leonard (M. D.). **A Dipterous Parasite of the Parsnip Webworm** (*Depressaria heracleana*, **L.**).—*Jl. Econ. Ent., Concord, N.H.*, xiii, no. 6, December 1920, p. 491–492.

The Tachinid, *Dichaetoneura leucoptera*, Johns., is recorded as parasitising *Depressaria heracleana*, L. (parsnip webworm) in New York.

Frost (S. W.). **A new Apple Pest in Pennsylvania.**—*Jl. Econ. Ent., Concord, N.H.*, xiii, no. 6, December 1920, p. 492.

Eulia velutinana, Wlk., although known to occur on maple and balsam, is recorded for the first time as attacking apples in Pennsylvania. There are probably several generations during the year, and the injury continues throughout the summer. The adult moths, emerging in June, lay eggs in batches of 20 to 40 on the leaves, but those appearing in May after hibernation oviposit on the large limbs and trunks of the apple tree.

Smith (M. R.). **An Insect supposed to breed in Corn.**—*Jl. Econ. Ent., Concord, N.H.*, xiii, no. 6, December 1920, p. 493.

Attention is drawn to an apparently erroneous record of *Achatodes zeae* as a pest of maize. The larva of this species is liable to be mistaken for that of *Diatraea zeacolella*, or other maize borers, but evidently feeds exclusively in the stems of elder (*Sambucus* sp.).

Vorhies (C. T.). **Entomology.**—*30th Ann. Rept. Arizona Agric. Expt. Sta., 1918–19, Tucson*, 31st December 1919, pp. 437–438. [Received 7th January 1921.]

In April 1919 a small beetle destroyed cotton, grown for experimental purposes, by feeding on seedlings just beneath the surface of the soil. It is supposed that the cottonseed meal used as a fertliser had attracted this pest, which is provisionally identified as *Blapstinus pimalis*.

The maize stalk borer noticed in the preceding year has been identified as *Diatraea lineola*, a moth hitherto unrecognised as a pest, but very closely allied to the larger corn-stalk borer of the East (*D. zeacolella*), and with habits and life-history so nearly alike that for all practical purposes it may be regarded as the same.

Ewing (H. E.). U.S. Bur. Ent. **New Predaceous and Parasitic Mites of the Superfamily Gamasoidea (Acar.).**—*Ent. News, Lancaster, Pa.*, xxxi, no. 10, December 1920, pp. 286–293.

Among the new mites described are :—*Laelaps bermudaensis* from bananas and cedars in Bermuda ; *Seius safroi* from Oregon [*R.A.E.*, A, vi, 263] ; *Gamasus inarmatus* from red clover roots in Idaho ; *Uropoda bermudaensis* from bananas in Bermuda ; and *U. robusta*, imported into U.S.A. on palm seeds from Ecuador.

Lovett (A. L.). **Spreaders in the Spray Solution as an Aid in Efficient Codling Moth Control.**—*Rept. Proc. 15th Ann. Meeting Washington State Hortic. Assoc., Spokane, 1st–5th December 1919, Olympia, Wash.*, 1920, pp. 7–14. [Received 7th January 1921.]

Some of the data obtained in previous investigations on the comparative values and killing efficiency of various types of standard arsenates [*R.A.E.*, A, iii, 655, 759 ; v, 477 ; vi, 338] were the basis for work, certain phases of which concerned with improvement in spray practices as aids in efficient control of codling moth [*Cydia*

pomonella] formed the subject of this address. The information given has already been noticed to a large extent [*R. A. E.*, A, vi, 199; viii, 372].

Darlington (P. S.). **Codling Moth Control vs. Extermination.**—*Rept. Proc. 15th Ann. Meeting Washington State—Hortic. Assoc., Spokane, 1st–5th December 1919, Olympia, Wash.*, 1920, pp. 14–22. [Received 7th January 1921.]

It is estimated that in 1918 the State of Washington spent about £300,000 (at par) in an attempt to control the codling moth [*Cydia pomonella*], and even then suffered a direct loss of £800,000. In the same year British Columbia had no direct loss from this pest owing to the policy of extermination adopted there since its first introduction. In all, 15 outbreaks have occurred there, but in each case the infested area was quarantined and the pest was stamped out before it could spread.

The commercial apple industry is older in Washington than in British Columbia, and it is likely that at its inception, and at the time the pest was introduced, there was not sufficient knowledge to make a campaign of extermination practicable.

There are in Washington certain areas still free from codling moth, and it is urged that with proper organisation migration into these can be checked and slight infestations stamped out. Experience in one area of 1,400 acres in Washington, in which infestation was reduced from 20 per cent. to 2 per cent. in one year, leads the author to believe that it is possible to exterminate this pest even in old badly infested areas. The trees in the area in question were about 15 years old, and 20–25 ft. high. The spray contained 4 lb. lead arsenate to a 400 U.S. gallon tank. Wherever possible a rod and Bordeaux nozzle were used, with a pressure of 250–300 lb. Where there were varieties that did not bloom at the same time, two calyx sprays were used. At the time the calyx spray was applied no larvae were hatching, but they began doing so 3–4 weeks later. The first cover spray was the time for the chief outbreak of the first brood of caterpillars. The second cover spray was applied against the second brood, about 7–8 weeks later. In some cases an additional spray was applied about half-way between the two cover sprays, where there were enough stragglers of the first brood to justify it.

Childs (L.). **Degree of Codling Moth Control obtained with Spray Gun and Spray Rod and the Dusting Methods.**—*Rept. Proc. 15th Ann. Meeting Washington State Hortic. Assoc., Spokane, 1st–5th December 1919, Olympia, Wash.*, 1920, pp. 22–39. [Received 7th January 1921.]

The information given here is substantially the same as that noticed in another paper [*R. A. E.*, A, viii, 462]. Stress is laid on the need for a sufficiently powerful sprayer, about 10 horse-power being required with 2 spray-guns. From figures that have accumulated, it appears that *Cydia pomonella* is inclined to deposit more eggs in the tops of the trees than nearer the ground; fruit should therefore either not be grown at that height or be very well sprayed. A spraying tower would enable the necessary effect to be obtained.

Melander (A. L.). **Some Observations on Orchard Sprays.**—*Rept. Proc. 15th Ann. Meeting Washington State Hortic. Assoc., Spokane, 1st–5th December 1919, Olympia, Wash.*, 1920, pp. 40–46.

In spraying experiments conducted during 1919, oil emulsions proved better than sulphur sprays against San José scale [*Aspidiotus perniciosus*], but their general use is hindered by commercial and technical difficulties. Liquid lime-sulphur is still superior to the various dry substitutes that have been introduced of recent years. Many of the claims made for the dry preparations are mis-statements of fact.

Work against codling moth [*Cydia pomonella*] has emphasised the greater value of calyx spraying over that of all subsequent applications. If cover spraying could be as efficient, the pest would be easily annihilated, even in a single season. As it is practicable to give a perfect calyx spraying, the destructiveness of the pest is in proportion to the effectiveness of the cover sprays.

Thinning out infested apples during the occurrence of the first brood is as important as late spraying. Theoretically the calyx spray and thinning together should wipe out this pest, but in practice cover sprayings are a necessity because thinning is neglected or incomplete. The number of larvae entering the fruit is not lessened by using extra strong sprays, and 1 lb. lead arsenate in 80 U.S. gallons remains the right strength.

Calcium arsenate is a promising new spray, and no scorching was apparent in any tests with it. While the spray gun is excellent for cover spraying, the clipper nozzle, crook, rod and tower method still appears best for calyx spraying.

The real need in arsenical spraying is for a spreader ; in these tests soap gave excellent results in neutralising the waxy nature of the apple skin ; about six bars of laundry soap were used per tank.

Milliken (F. B.). **Grasshoppers and their Control on Sugar Beets and Truck Crops.**—*U.S. Dept. Agric., Washington, D.C.*, Farmers' Bull. 691, March 1920, 20 pp., 13 figs. [Received 7th January 1921.]

This bulletin, issued in revised form, gives the usual remedial measures against grasshoppers, with notes on the more injurious species and their natural enemies.

Stockdale (F. A.). **Two Insect Pests of Tea in Ceylon.**—*Trop. Agric., Peradeniya*, lv, no. 5, November 1920, pp. 276–279, 2 plates, 1 fig.

The first part of this paper, dealing with *Xyleborus fornicatus* (shot-hole borer of tea), is based on the observations of Speyer and Jepson. A short account is given of the history and spread of this beetle in Ceylon, the regulations as to the removal of nursery plants directed against it, its bionomics and the damage it does, and the remedial measures employed. The latter are directed chiefly towards the sanitary improvement of estates by the eradication of castor plants, the removal of die-backs, and the treatment of prunings, while good cultivation is essential. An insecticidal paint has been evolved, but probably costs too much at present for general use [*R.A.E.*, A, viii, 110, etc.].

X. fornicatus is said to have been recorded from various parts of India from time to time, but the only specimens received in Ceylon have been in castor from Bangalore. Other species of *Xyleborus* occur in Ceylon, of which *X. compactus* may become a pest of tea.

The second part of the paper deals with *Homona coffearia* (tea tortrix), and is based on the work of Jardine. Severe outbreaks of this moth occur in three-year cycles, the polyhedral disease becoming prevalent when the larvae are overcrowded, and leaving only a small number alive. Attempts to cause outbreaks of the disease artificially have not succeeded. Small outbreaks of *H. coffearia* may be dealt with effectively by means of a lead chromate spray [*R.A.E.*, A, vii, 113]. The total-life history of the moth occupies six to eight weeks ; July, August and September are the chief months in which eggs are laid.

JEPSON (F. P.). **Shot-hole Borer of Tea.**—*Trop. Agric., Peradeniya,* lv, no. 5, November 1920, pp. 280–289.

In the first half of 1920 a number of experiments were carried out to test possible methods of control directed against *Xyleborus fornicatus* on tea. Painting [*R.A.E.*, A, vii, 261, etc.] gave inconclusive results, while experiments with castor as a trap-tree were not completed. In this connection it may be mentioned that a severe infestation of castor was observed in one district, the surrounding tea being comparatively free from attack. Control pruning experiments were also unfinished, but seemed in some cases to involve rather serious mutilation of the bushes. Some cases of healing of the gallery entrance-holes were observed in a few instances while the galleries were still tenanted ; possibly this was caused by a stimulation of plant growth due to manure and pruning. It was shown that the suggestion that the shade of dadap (*Erythrina*) controls *X. fornicatus* was not correct.

Dadap and *Grevillea*, as well as castor and tea, are attacked by the beetle, but it has not been observed to rear broods in *Grevillea*. A Scolytid believed to be *X. fornicatus* has also been found in *Cedrela toona*.

Trogositid beetles are reported as preying on *X. fornicatus* on quite a large scale, and in one case a predaceous Clerid was found associated with it. Staphylinid and other beetles are also associated with the borer, but there is no indication that they are predaceous on it. The larvae of *H. fornicatus* are, however, destroyed by those of a Drosophilid fly, *Phortica xyleboriphaga*, Senior-White, and some stage of this fly was found in 5 per cent. of the galleries examined.

There is a possibility that the Chalcid that destroys 5 per cent. of *X. coffeae* in Java might be able to adapt itself to the closely allied *X. fornicatus*.

HUTSON (J. C.). **Paddy Fly.**—*Trop. Agric., Peradeniya,* lv, no. 5, November 1920, pp. 290–292, 1 plate.

This is a popular account of the paddy "fly" [*Leptocorisa varicornis*, F.]. The importance of clean cultivation is emphasised, and the usual remedial measures described. [*R.A.E.*, A, viii, 411, etc.]

HUTSON (J. C.). **Crop Pests in Ceylon.**—*Trop. Agric., Peradeniya,* lv, no. 5, November 1920, p. 293.

During the period under review, 1st July to 30th September 1920, there was a drought in most of the tea districts, and mites, scale-insects and Aphids were prevalent, particularly on bushes in poor condition. In a few localities outbreaks of *Heterusia cingala* (red slug), nettle grubs (*Natada nararia* and others) and Psychids have occurred in unusual numbers, and a few instances of attack by *Zeuzera coffeae* (red borer) were reported.

Rubber was attacked by *Saissetia nigra* (black scale), and in a few instances by *Batocera rubus* (stem and root borer) and *Comocritis pieria* (bark-eating caterpillar).

The more important miscellaneous pests were *Dacus* (*Bactrocera*) *cucurbitae* (melon fly) in cucurbits, *Odoiporus longicollis* (banana borer), *Hypsipyla robusta* (toon borer), *Terastia meticulosalis* (dadap borer) and *Taragama dorsalis* (dadap caterpillar).

Experiments against cutworms (*Agrotis*) were not successful enough to warrant the use of poison baits by small cultivators, owing to the cost of the materials—Paris green, pollard and jaggery. A moth trap with sweetened bait also caught few moths, none of which were *Agrotis* spp. Collection of the caterpillars daily and the protection of young plants by means of tins or bands are still the most practical measures against cutworms for small vegetable growers.

MEYRICK (E.). **Exotic Microlepidoptera.**—ii, pts. 12 and 13, December 1920 and January 1921, pp. 353–384 and 385–416. [Published by the author, *Marlborough, Wilts.* Price 3s. per part.]

Of the new species described the following were bred from plants of economic importance :—Assam : *Batrachedra sacrata*, from *Shorea robusta* (probably a refuse feeder) : *Phyllorycter* (*Lithocolletis*) *hapalotoxa*, from the bark of apple (*Pyrus malus*) ; and *Acrocercops malicola*, from larvae mining in bark of apple, causing the outer bark to peel off. Bengal : *Cydia* (*Laspeyresia*) *pycnochra*, from pods of *Sesbania grandiflora* ; *Hypophrictis plana*, from a case-bearing larva on the trunk of *Mangifera* ; *Oxylychna euryzona*, from *Heritiera fomes* ; *Hyladaula perniciosa*, from *H. fomes* ; *Synnympha perfrenis*, from *H. minor* ; and *Acrocercops zygonoma* from larvae mining under bark of cotton (*Gossypium*). Central India : *Xyloscopa* (gen. n.) *heterocrossa*, from log of *Buchanania latifolia*. North India : *Promalactis sponsalis*, from logs of *Shorea robusta*. Andamans : *Opogona choleropis*, from logs of *Terminalia bialata*. Nigeria and Natal : *Plemyristis oenochares*, from dry cacao pods. Fiji : *Stagmatophora erebinthia*, from pods of cow-pea (*Vigna*).

COSENS (A.). **Reports on Insects for the Year : Division No. 3, Toronto District.**—*50th Ann. Rept. Ent. Soc. Ontario, 1919, Toronto,* 1920, pp. 13–14. [Received 8th January 1921.]

Pieris rapae (cabbage butterfly) proved very troublesome during the season. *P. protodice* was recorded, but has not yet proved injurious in Ontario.

Morris (F.). **Report on Insects for the Year: Division No. 4, Peterborough District.**—*50th Ann. Rept. Ent. Soc. Ontario, 1919, Toronto,* 1920, pp. 14–15. [Received 8th January 1921.]

The insects recorded for the year include: *Saperda obliqua*, on alder; and *S. puncticollis* and *Psenocerus supernotatus* on Virginia creeper.

Noble (J. W.). **Report on Insects for the Year: Division No. 5, Essex District.**—*50th Ann. Rept. Ent. Soc. Ontario, 1919, Toronto,* 1920, p. 15. [Received 8th January 1921.]

Serious damage was caused by the Hessian fly [*Mayetiola destructor*] in wheat fields during 1919. Grasshoppers and crickets were particularly abundant owing to the dry weather, and wireworms and cutworms proved very destructive in the spring. The latter were successfully controlled by poison bran mixture.

The severe infestation of codling moth [*Cydia pomonella*] may also be due to the exceptionally favourable season for insect development. Damage by the plum curculio [*Conotrachelus nenuphar*], as well as by the usual fruit and vegetable pests, is recorded.

Spencer (G. J.). **Results of some Preliminary Experiments with Chloropicrin.**—*50th Ann. Rept. Ent. Soc. Ontario, 1919, Toronto,* 1920, pp. 18–21. [Received 8th January 1921.]

Chloropicrin apparently cannot be used in greenhouses against insect pests owing to its deadly effect on plants. To test the penetration of the gas, a flower-pot about 7 in. deep, containing earth, was exposed at night to a concentration of 8·7 oz. per 1,000 cubic feet for 11½ hours, at a temperature of 54° F., with a relative humidity of 88°. Though some of the millipedes contained in the soil at a depth of 1½ in. had gone deeper, all were dead 12 hours after the experiment. The larvae and adults of *Silvanus surinamensis* (saw-toothed grain beetle), *Tenebrio molitor*, *Tribolium confusum* (confused flour beetle), *Tenebroides mauritanicus* (cadelle), *Calandra granaria* (granary weevil) and *Plodia interpunctella* were all killed after exposure to a similar concentration for about 25 hours, but 58 per cent. of the pupae of *Sitodrepa panicea* (drug-store beetle) were still living.

Moore (G. A.). **Our Common Cercopidae.**—*50th Ann. Rept. Ent. Soc. Ontario, 1919, Toronto,* 1920, pp. 21–25. [Received 8th January 1920.]

A list of Canadian Cercopids is given, including:—*Philaenus lineatus*, L. (lined spittle hopper), which feeds on timothy grass and red top; *Aphrophora quadrinotata*, Say, often found on grape vines; *A. paralella*, Say, on pine trees, in company with *A. saratogensis*, L.; and *Lepyronia quadrangularis*, Say (angulated froghopper), on grasses, weeds and blackberry.

Leopold (—). **My Experience this Year in Dusting and Spraying (1919).**—*50th Ann. Rept. Ent. Soc. Ontario, 1919, Toronto,* 1920, pp. 25–30. [Received 8th January 1921.]

The object of the experiments described was to determine the action of liquid lime-sulphur on apples in Ontario, as compared with that of

liquid Bordeaux mixture, as well as the relative cost and efficiency of spraying and dusting. Bordeaux mixture did not prove in any way superior to the lime-sulphur wash used in the test orchard for the last ten years. Both dusting and spraying proved very satisfactory; dusting is certainly the more expensive method, but it is also quicker in application. The most economical dust consisted of 15 lb. sulphur, 5 lb. calcium arsenate and 80 lb. hydrated lime, calcium arsenate being cheaper than lead arsenate. Dust Bordeaux was used with satisfactory results, the formula being 46¼ lb. dry Bordeaux, as commercially prepared, with an equal quantity of hydrated lime and 7½ lb. calcium arsenate.

TOTHILL (J. D.). **Insect Outbreaks and their Causes.**—*50th Ann. Rept. Ent. Soc. Ontario, 1919, Toronto,* 1920, pp. 31–33. [Received 8th January 1921.]

An insect outbreak is generally due to the relaxing of some pressure of its environment that has previously held the species in equilibrium. Several well-known epidemics are mentioned in illustration of this. There is in New Brunswick at present an incipient outbreak of the fall webworm [*Hyphantria cunea*], and the causes that have contributed to this are discussed. In 1912 this moth had been fairly numerous for a decade or more, finding an abundance of its favourite food (alder) along the streams and waterways. The various factors constituting environmental pressure consisted of parasites of the various stages and of birds, particularly the red-eyed vireo. As a result of this pressure it is computed that the average number of moths yielded by each egg-mass (consisting of an average of 260 eggs) would be less than two, and this decrease in numbers continued steadily until 1916, when the insect became almost extinct in the Province, its parasites dying out with it. Then a flight of moths was blown across the Bay of Fundy, and heavily infested a considerable area along the coast. Birds have not been sufficient to keep this infestation in check, and parasites are not likely to be present until the present outbreak extends to the territory in which they now occur.

It is also pointed out that civilisation is responsible for many notorious outbreaks. In New Brunswick large tracts of forest lands have been planted with pure stands of poplar in place of the old mixed growth, thus encouraging the forest tent caterpillar [*Malacosoma disstria*], while similar areas of balsam fir provide abundant material for an outbreak of spruce budworm [*Tortrix fumiferana*]. In these cases, the restraining factor that has previously held the numbers in check was the limited supply of food.

ROSS (W. A.) & ROBINSON (W.). **Further Notes on the Control of Pear Psylla.**—*50th Ann. Rept. Ent. Soc. Ontario, 1919, Toronto,* 1920, pp. 33–38. [Received 8th January 1921.]

Experiments are recorded with various ovicides for pear psylla [*Psylla pyricola*] at different stages of incubation. Lime-sulphur 1 : 7 proved most effective, destroying all eggs, but affecting newly-laid ones more readily than those about to hatch. The addition of 2 lb. starch to 40 gals. of weaker lime-sulphur sprays increased their value. In using soluble suphur, 10 lb. hydrated lime was added to 12½ lb. sulphur in 40 gals. of water to prevent injury to the bursting

buds. First and second instar nymphs were also rapidly destroyed by lime-sulphur 1 : 8 and 1 : 9 with or without starch. All the sprays used injured the buds and foliage to a slight but not an appreciable extent. In order to destroy nymphs that had escaped the first spray a second application was made after the blossoms fell ; $\frac{3}{8}$ pint to 40 gals. of Blackleaf 40 was added to the usual spray for codling moth [*Cydia pomonella*] and the results were excellent.

MARLATT (C. L.). **The Federal Plant Quarantine Act.**—*50th Ann. Rept. Ent. Soc. Ontario, 1919, Toronto,* 1920, pp. 38–43. [Received 8th January 1921.]

The inauguration and working in the United States of the Federal Plant Quarantine Act is discussed, and the most important quarantines of the present day are reviewed. A brief account is given of the nursery stock, seed and plant quarantines.

LOCHHEAD (W.). **Hopkins' Bioclimatic Law.**—*50th Ann. Rept. Ent. Soc. Ontario, 1919, Toronto,* 1920, pp. 43–49, 3 figs. [Received 8th January 1921.]

The author discusses Hopkins' bioclimatic law [*R.A.E.*, A, viii, 87, 278] which he describes as one of the most far-reaching contributions to economic entomology. He believes that it would be practicable and most advantageous to obtain similar data for Canada to that compiled for the United States, relying upon the Canadian experiment stations and the reports prepared by the Federal and Provincial agencies for the data relating to phenological problems. The hope is expressed that some competent Government official may undertake this work, with a view to the extension of the practical application of the law to the different sections of Canada.

CRIDDLE (N.). **Locusts in Manitoba, with special Reference to the Outbreak of 1919.**—*50th Ann. Rept. Ent. Soc. Ontario, 1919, Toronto,* 1920, pp. 49–53. [Received 8th January 1921.]

A review of previous locust invasions in Manitoba indicates that these are likely to occur at intervals of about 15 years, and that the infestation will probably last two or more years. The literature of the 19th century records by far the most important injury by *Melanoplus spretus* (migratory locust), *M. atlantis* and *Camnula pellucida* being present in lesser numbers. The last outbreak of any importance began in 1900, and was largely quelled in the second year by the use of poison baits ; after about 14 years, during which the Province has been practically free from locusts, some half a million acres in southern Manitoba were threatened by a serious invasion in 1919. By the time reports of damage were circulated, the young hoppers were beyond immediate control, and whole fields were swept bare, while materials for bait were lacking. The manner in which the infestation was gradually subdued by the use of poison bait, and later by a hopper-dozer, is described. In this outbreak, for the first time on record, the chief species was *Camnula pellucida.* This differs from *Melanoplus* in selecting for oviposition roadsides and grassy areas, depositing its eggs in clumps of grass, while *Melanoplus* oviposits in bare ground among sparse vegetation or in stubble fields. It also flies lower than

the other species referred to. While spreading over the fields in the wingless stages, it returns to the stubble and grass-lands for the breeding season. Species of minor importance accompanying *C. pellucida* were *M. minor, M. packardi, M. gladstoni, M. dawsoni, M. bivittatus* and *M. femur-rubrum.* The campaign of 1919 demonstrated the value of effective preparation and energetic action, and organisation is complete to meet the expected invasion of 1920. The location of the eggs is known, and the young hoppers can be attacked immediately upon hatching. Deep ploughing has destroyed many eggs, especially of *Melanoplus.* Exposure to the sun also kills them, as they cannot survive a temperature of 90° F. for many hours.

Buckell (E. R.). **Life-history Notes on some Species of Acrididae (Orthoptera) found in British Columbia.**—*50th Ann. Rept. Ent. Soc. Ontario, 1919, Toronto,* 1920, pp. 53–61. [Received 8th January 1921.]

A list is given of the grasshoppers occurring in British Columbia, with some notes on their habitat, food-plants, etc., though it has been impossible to complete the life-history of many of them.

Brittain (W. H.). **One Year's Experiments in the Control of the Cabbage Maggot.**—*50th Ann. Rept. Ent. Soc. Ontario, 1919, Toronto,* 1920, pp. 61–68. [Received 8th January 1921.]

Experiments in the control of *Phorbia brassicae* (cabbage maggot) were continued on the lines of the previous year [*R.A.E.*, A, viii, 4], and the results are shown in tables. Materials that gave some measure of success, but that do not seem worthy of further trial in view of the better results obtained with other substances, include nicotine sulphate and clay, nicotine and sulphur, para-dichlorobenzene alone, and salt solution. Other materials, which actually seemed to weaken the plants, were dry lime-sulphur, white arsenic, sodium arsenate, and combinations of these compounds. A mixture of 40 per cent. tobacco dust, 1 per cent. corrosive sublimate and 59 per cent. clay produced the largest number of uninfested plants; but a mixture of 1 per cent. creosote to 99 per cent. clay gave the largest tonnage per acre, with lower cost of treatment. Anthracene oil in place of the creosote, and a mixture of 10 per cent. para-dichlorobenzene and 90 per cent. Scotch soot, both gave somewhat less success. Plots treated with this last mixture come second in tonnage per acre produced, though showing fewer plants free from injury. The plants in these plots were of a deeper green and healthier colour generally than those in the others.

Treherne (R. C.) & Ruhmann (M. H.). **The Control of the Cabbage Root Maggot in British Columbia.**—*50th Ann. Rept. Ent. Soc. Ontario, 1919, Toronto,* 1920, pp. 68–70. [Received 8th January 1921.]

Tests are recorded in which corrosive sublimate treatment was tried in comparison with the tar-paper-disc method of controlling *Phorbia brassicae* (cabbage root maggot) [*R.A.E.*, A, viii, 4]. The tests were made with cauliflowers, and the results clearly showed that in low-lying lands tar-paper discs are unsatisfactory, as heat acting on the subsoil moisture produced condensation beneath the disc, causing a condition known as wilt. Corrosive sublimate in three treatments

of 1 oz. to 8 or 10 gallons gave very satisfactory results, and was found to be quite safe. Notes are given on the life-history of *P. brassicae* in Armstrong, as distinguished from that in Lower Fraser Valley, where former observations had been carried out.

GIBSON (A.). **Further Data on the Control of the Cabbage Root Maggot in the Ottawa District.**—*50th Ann. Rept. Ent. Soc. Ontario, 1919, Toronto,* 1920, pp. 71–73. [Received 8th January 1921.]

Experiments with corrosive sublimate for the control of *Phorbia brassicae* (cabbage root maggot) show that 1 oz. in 10 gals. of water gives as good results as 1 oz. in 4 gals. of water. Three applications proved equal in efficiency to four. Tests with the use of discs and tobacco and lime show poorer results. The corrosive sublimate treatment had no deleterious influence either upon the plants or in the relative number of soil organisms present in treated as compared with untreated soil. It also seemed to have a stimulating effect upon the growth of the plants.

CAESAR (L.) & HUCKETT (H. C.). **Cabbage Maggot Control.**—*50th Ann. Rept. Ent. Soc., Ontario, 1919, Toronto,* 1920, pp. 73–77. [Received 8th January 1921.]

The results of tests with insecticides on radishes infested with *Phorbia* (*Chortophila*) *brassicae* (cabbage maggot) are shown in tables. Corrosive sublimate was the only substance that gave satisfactory results. If applied stronger than 1 : 1,000 to young plants it temporarily weakens them ; even at this strength too heavy soaking around very young plants may cause a sickly appearance of the foliage for a few days. The best time for treatment with corrosive sublimate has not yet been determined. Even if applied within 24 hours of sowing the seed, it appears to have no injurious effect upon germination. Its application has a decidedly beneficial result upon the size, shape and quality of the radishes. Tobacco dust and soft coal soot both gave excellent foliage, but the radishes were inferior. Both of these substances, and also a mixture of tobacco dust, sulphur and lead arsenate powder, were useless, and in most cases seemed to encourage the presence of the fly.

Corrosive sublimate does not seem to have any deterrent effect on the hatching of the eggs of *P. brassicae,* neither do the larvae seem to be killed by contact with it, but possibly its repellent action may cause the latter to wander away from the plant and so bring about their death. Tests show that the pupae are not killed by this insecticide.

STRICKLAND (E. H.). **The Present Status of Mill-infesting Pests in Canada.**—*50th Ann. Rept. Ent. Soc. Ontario, 1919, Toronto,* 1920, pp. 77–80. [Received 8th January 1921.]

An investigation among flour mills, bakeries and warehouses has shown that the chief pest in flour mills is *Ephestia kühniella* (Mediterranean flour moth), which is sometimes so numerous that the silk spun by the larvae clogs the elevators so that they have to be dismantled. Flour beetles (*Tribolium* spp.) are almost as numerous in Canadian mills, but as they do not interfere with the process of

milling they are frequently overlooked. The processes of superheating and fumigation against these insects are described. Freezing is another method much practised in the Prairie Provinces, where extremely low temperatures can be relied upon at almost any time in the winter. While adults of both pests all perish at 25° below zero, it is not known whether all the stages are destroyed to the same degree. Freezing, moreover, is recognised to be deleterious to the mill.

Since 90 per cent. of the infestation probably occurs owing to the use of second-hand bags, the remedies suggested are to avoid the use of these wherever practicable, and when they must be used, to sterilise them by heat before they are allowed to enter the warehouse. It is suggested that they should be accumulated in a small, detached building that could be superheated once every two weeks. If possible, the warehouse should be superheated as well as the mill.

HUDSON (H. F.). **Some Notes on the Life-history of our Common June Beetles.**—*50th Ann. Rept. Ent. Soc. Ontario, 1919, Toronto,* 1920, pp. 81–83. [Received 8th January 1921.]

White grubs, occurring on the sand and sandy loam soils of Western Ontario, are most injurious and difficult pests to deal with. In Middlesex County, where the present investigations were conducted, the species found were *Lachnosterna fusca, L. rugosa, L. dubia, L. gibbosa, L. marginalis, L. ilicis* and *L. inversa*. Of these, *L. dubia, L. rugosa* and *L. gibbosa* have been reared from the egg. The beetles appear early in May, and oviposition occurs two or three weeks after pairing. The life-history of these beetles occupies at least three years, and sometimes four. The grubs feed ravenously during the second and third years of their growth, and in the third year pupate in late July or early August, producing the adult in September, which remains in the earthen cell below ground until the warm weather of the next year. *L. gibbosa* is the earliest to appear in numbers, and may continue until mid-July. Males are apparently nearly twice as numerous as females. *L. rugosa* appears about a week later than *L. gibbosa,* and feeds freely on the foliage of most trees ; males are considerably more numerous than females. *L. fusca* appears about the same time as *L. gibbosa,* but reaches its maximum number somewhat later ; females predominate in this species. *L. dubia* is one of the earliest to appear, but seems to have a shorter season than the others ; females occurred in more than double the number of males.

Information regarding natural control in Canada is scanty. Crows, blackbirds, poultry and skunks all devour the grubs. The Tachinid, *Microphthalma disjuncta,* has been reared from them, and another insect enemy is probably *Pelecinus polyturator*. Cocoons of *Tiphia inornata* have also been collected in badly infested fields. The indications are that to avoid injury by the grubs, arable land should not be in pasture more than two years, and a definite system of short-crop rotation should be followed, with frequent growing of clover and clean farming.

HUDSON (H. F.). **Report of the Insects of the Year : Division No. 6.**—*50th Ann. Rept. Ent. Soc. Ontario, 1919, Toronto,* 1920, pp. 83–84. [Received 8th January 1921.]

The more important insects of 1919 in Ontario include *Hypera* (*Phytonomus*) *punctata* (clover leaf weevil), which heavily infested

clover and timothy fields in low-lying pasture lands, but which disappeared suddenly owing to a fungous disease caused by the unusually wet weather. Cutworms were very numerous in old sod lands, particularly the glassy cutworm [*Sidemia devastatrix*]. Potato flea-beetles (*Epitrix cucumeris*) were extremely abundant, but can be controlled by lead arsenate sprays. Potato beetles (*Leptinotarsa decemlineata*) were more abundant than usual, but did not attack potatoes that were planted late. The leaf-hopper, *Empoasca mali*, has recently begun to attack potatoes. Some success has been obtained by using one tablespoonful of Blackleaf 40 to one gallon of water, with 2 oz. of soap.

DOWNES (W.). **The Strawberry Root Weevil in British Columbia.**—*50th Ann. Rept. Ent. Soc. Ontario, 1919, Toronto,* 1920, pp. 84–88. [Received 8th January 1921.]

Otiorrhynchus ovatus, L. (strawberry root weevil) has been the object of study for some ten years in British Columbia, where it is one of the most destructive pests of small fruits [*R.A.E.*, A, i, 92; iii, 7; v, 469; etc.]. The most recent observations have proved that this is undoubtedly an indigenous and not an introduced weevil. To the previously known wild food-plants of the larvae must be added the snowberry (*Symphoricarpus racemosus*) and the oak; and to the cultivated plants, red clover. For this reason, strawberries should never be planted following clover. Oviposition extends from mid-May to mid-September. The eggs are laid promiscuously around the plants, sometimes against the crown and sometimes a little below the surface. It is evident from investigations in 1919 that not only the summer generation, but also the over-wintered adults, deposit eggs in large numbers, beginning in mid-May and continuing until 30th August, some individuals laying nearly 200 eggs. The adults of the summer generation begin to oviposit in July, and continue to do so until mid-September. It is thought that a proportion of the summer generation does not die, but hibernates after ovipositing, and emerges in the spring to oviposit again. Parthenogenesis has been proved for *O. ovatus* by rearing adults from pupae, which oviposited though isolated in glass vials, the eggs hatching into normal larvae. The fertility of eggs varied from 68 per cent. in the case of those laid by over-wintered adults to 80 per cent. in the case of those laid by the summer generation. The weevils leave their hibernation quarters (which may be in houses, among piles of stones, or, in warm climates, in the crown of the strawberry plants) with the first fine weather, generally about March, and are fairly active until May, when they settle down on the strawberry plants; migration is again observed with the summer generation, which reaches a climax at midsummer, gradually lessening until the time of hibernation.

Following the principles of remedial measures that have previously been laid down [*loc. cit.*], it is intended to demonstrate the possibility of control in a badly infested district, the procedure being to pull up and burn the strawberry plants at the end of August or beginning of September. Leaving them until this time induces the adults to remain in the field and oviposit there. The field will then be ploughed and left fallow for about a month, all strawberry roots being removed from the soil. Young larvae present in the soil should thus be starved, and the land might be sown with autumn wheat, with vetches or clover. The land may remain in clover two years, and should then be

ploughed in the autumn and potatoes planted the following year. By the next year strawberries may again be grown. Not more than two consecutive crops of strawberries should be taken from a field. Although the danger of using clover has been explained above, nothing will quite take its place, unless it can be shown that it is equally profitable to grow peas or vetches, or some other legume, and still maintain the fertility of the soil.

These oviposition records emphasise the necessity of destroying as many adults as possible. Poultry will be found of great benefit in this respect. They should be shut up during blossoming time, and allowed to run again after the crop is off. To overcome the difficulty of new plantations being reinfested by adjacent old ones, trials are being made with wooden barriers fitted with a band of tanglefoot.

Ross (W. A.) & Curran (C. H.). **The Strawberry Weevil.**—*50th Ann. Rept. Ent. Soc. Ontario, 1919, Toronto,* 1920, pp. 88–95, 4 figs. [Received 8th January 1921.]

The strawberry weevil [*Anthonomus signatus*, Say] sometimes destroys as many as 75 per cent. of the buds in strawberry fields in Ontario, all the staminate varieties being liable to attack. The adults appear in May, and oviposit, at first on strawberry and later on raspberry and blackberry, from mid-May until late June. The egg is laid within the bud, usually among the stamens, and after ovipositing the weevil crawls down the stem and cuts it, so that the bud either falls immediately or is left hanging by a thread. The larva feeds at first on the pollen and the interior of the bud, and eventually bores its way into the receptacle, forming within it a closed cell, the entrance being plugged with excreta. The average larval period is 13 days; pupation occurs within the bud and lasts about 10 days. The adults emerge from the buds during late June and July, and feed freely upon the strawberry leaves and various other plants and weeds. They go into hibernation at midsummer, choosing vegetation and rubbish in adjoining waste lands, under which they shelter, or about the leaves of strawberry plants. Lead arsenate and sulphur repellents that have been known to succeed [*R. A.E.*, A, iv, 189; vii, 256] were used with good results, only 5 per cent. of the buds being destroyed when the above substances were used as a dust in the proportion 20 : 100 or 10 : 90.

Ross (W. A.) & Caesar (L.). **Insects of the Season in Ontario.**—*50th Ann. Rept. Ent. Soc. Ontario, 1919, Toronto,* 1920, pp. 95–104, 10 figs. [Received 8th January 1921.]

Injurious insects of 1919, in addition to those already mentioned [*R. A.E.*, A, ix, 124, 129], include *Cydia pomonella* (codling moth), which, however, did little damage in well-sprayed orchards; *Coleophora fletcherella* (cigar case-bearer); *Eucosma ocellana* (bud moth); *Eriophyes pyri* (pear-leaf blister mite); *Campylomma verbasci* (mullein leaf bug), which was found attacking a large percentage of apples and causing scarring and deformation; *Aspidiotus perniciosus* (San José scale), which is gradually increasing again in neglected orchards; *Ancylis nubeculana* (apple leaf sewer); *Enarmonia prunivora* (lesser apple worm); *Eriocampoides limacina* (pear slug), the first generation

of which defoliated thousands of pear trees, while the second generation was highly parasitised ; *Macrodactylus subspinosus* (rose chafer), on apples, grapes and cherries ; *Hemerocampa leucostigma* (tussock moth) ; *Hyphantria cunea* (fall webworm) ; *Conotrachelus nenuphar* (plum curculio), which was particularly injurious to peaches ; *Parornix* (*Ornix*) *geminatella* (unspotted tentiform leaf-miner) on apples ; *Phyllocoptes schlechtendali* (silver leaf-mite), on peach foliage ; *Empoa rosae* (rose leaf-hopper), causing mottling of the leaves in apple orchards ; *Taeniothrips inconsequens* (pear thrips) ; and *Ormenis pruinosa* (pear Fulgorid).

Insects attacking grapes and small fruits included : *Erythroneura comes* (grape leaf-hopper) ; *Metallus bethunei* (blackberry leaf-miner), of which egg and larval parasites were more abundant than in the previous year ; *Ancylis comptana* (strawberry leaf-roller) ; *Pteronus ribesii* (imported currant worm), on currants and gooseberries ; *Aphis forbesi* (strawberry root aphis) ; *Aegeria* (*Sesia*) *tipuliformis* (imported currant borer), in black currants ; and *Typophorus canellus* (strawberry root borer).

Pests of vegetables included *Phorbia* (*Chortophila*) *brassicae* (cabbage maggot) ; *Hylemyia antiqua* (onion maggot) ; *Pieris rapae* (imported cabbage worm), on cabbages and cauliflowers ; *Plutella maculipennis* (diamond-back moth), in cabbage fields ; *Heliothis obsoleta* (corn ear worm), on both sweet and field maize that was planted late ; *Protoparce* (*Phlegethontius*) *quinquemaculata* (tomato or tobacco worm) ; *Acyrthosiphon* (*Macrosiphum*) *pisi* (pea aphis) ; cutworms on cabbage, tomato and maize ; *Crioceris asparagi* and *C. duodecimpunctata* (asparagus beetles), which were parasitised by the Chalcid, *Tetrastichus asparagi* ; *Aphis brassicae* (cabbage aphis), which caused considerable injury late in the season to cabbage, cauliflower and turnips, but was largely checked by insect enemies, one of the most important being *Aphidoletes fulva* ; *Systena frontalis* (red-headed flea-beetle), unusually prevalent on beans ; *Cosmopepla bimaculata* (black stink-bug), on grain and on the tips of asparagus plants ; *Thrips tabaci* (onion thrips) ; *Lygus pratensis* (tarnished plant bug), on garden plants, potatoes and celery, where it is believed to be the chief carrier of soft rot or black heart of celery ; *Lema trilineata* (three-lined leaf beetle), on potatoes ; and *Diabrotica vittata* (striped cucumber beetle).

Field crops were attacked by *Hypera* (*Phytonomus*) *punctata* (clover leaf weevil), which ruined large areas of clover, but which was largely destroyed by a fungus disease ; *Blissus leucopterus* (chinch bug), which injured meadow grasses, particularly timothy, oats and maize, but was heavily attacked by the fungus, *Sporotrichum globuliferum* ; *Crambus caliginosellus*, on wheat ; and *Bruchophagus funebris* (clover seed Chalcid).

Miscellaneous pests included *Chermes abietis* and *C. similis* (spruce gall Aphids) ; grasshoppers ; *Alabama argillacea* (cotton worm) ; *Neocerata* (*Dasyneura*) *rhodophaga* (rose midge), in greenhouses ; and *Itonida tecomiae* (trumpet vine midge).

FELT (E. P.). **Later Developments in the European Corn Borer Situation.**—*50th Ann. Rept. Ent. Soc. Ontario, 1919, Toronto,* 1920, pp. 110–111. [Received 8th January 1921.]

There has recently been a considerable extension of infestation by the European corn borer [*Pyrausta nubilalis*] in New York State,

but it is significant that the moth has produced only one generation in a season in these areas, which has considerably limited the damage. It is possible, however, that two generations may prove to be the normal condition, as in other regions. It is suggested that more thorough scouting work is necessary to locate and report upon scattered and isolated infestations. The agencies producing these fresh areas of infestation are not yet known, but it seems as though railways are an important factor in carrying the moths, as both the eastern and western areas in New York State have good railway connections with the older infested area in Massachusetts. It is not probable that the occurrence of a single generation, even if normal in New York State, will extend to the southern and warmer maize-growing belt, and the sparsely infested areas are regarded as a great menace to the maize crop of America.

HASE (A.). **Beiträge zur Morphologischen und Biologischen Kenntnis der Schlupfwespe,** *Lariophagus distinguendus* **(Först.), Kurdj.** [Contributions to the Morphological and Biological Knowledge of *L. distinguendus.*]—*Sitzungsber. Ges. Naturforsch. Freunde, Berlin,* December 1919, no. 10, 10th February 1920, pp. 402–432, 10 figs.

The morphology and biology of *Lariophagus distinguendus*, Först., parasitic on the larvae of *Calandra granaria*, L., are described. Details are given of the methods of feeding, the mode of locomotion, and the effect of external influences such as light and heat.

Le Service phytopathologique aux Pays-Bas. [The Plant Protection Service in the Netherlands.]—*Verslagen en Meded. Phytopath. Dienst, Wageningen,* no. 13, June 1920, 8 pp. [Received 30th December 1920.]

This bulletin describes the organisation and duties of the Dutch Plant Protection Service.

Het Stengelaaltje (*Tylenchus devastatrix*). **Het Bieten of Haveraaltje** (*Heterodera schachtii*). **Het Wortelaaltje** (*Heterodera radicicola*). [The Stem Eelworm. The Beet or Oat Eelworm. The Root Eelworm.]—*Phytopath. Dienst, Wageningen,* Vlugschr. nos. 19, 20, 21, December 1919, 12 pp., 15 figs.

Each of these three circulars gives information about, and combative methods for, one of the three Nematodes named above.

FEYTAUD (J.). **La Question Phylloxérique. La Crise des Porte-Greffes en Espagne.** [The *Phylloxera* Question. The Crisis of Grafted Vines in Spain.]—*Bull. Soc. Vulg. Zool. Agric., Bordeaux,* xix, nos. 9–10, September–October, and 11–12, November–December, 1920, pp. 97–100 and 113–116.

When the resistance of American vines to *Phylloxera* was proved in 1869, it was hoped that the problem of preserving vineyards from this pest was solved. As these were far from equal in quality to those of southern Europe, a number of species were grafted on to the old stock,

the hybrids offering more or less resistance to *Phylloxera*. The species that were crossed and the principal strains in various parts of Spain are discussed. In 1918 the author was requested to visit the vineyards of la Rioja where damage from *Phylloxera* was recorded on the grafted vines, and it was found that these hybrids had proved non-resistant to a fresh invasion of the insect. In France the climate is somewhat less favourable to the rapid multiplication of this Aphid than that of Spain, but it is most likely that a similar recrudescence of infestation will occur there. An examination of some of the vineyards of Cognac has shown that some hybrids, in particular that known as 1202, have perished owing to attacks of *Phylloxera*. It is not suggested that the grafting of French and American vines has proved a failure, but that it should be undertaken with due precaution. The so-called resistance of certain French–American hybrids may have gained its reputation merely owing to a temporary abatement of the *Phylloxera* infestation, and this reputation may soon be destroyed by a fresh outbreak of the pest.

THOMPSON (W. R.). U.S. Bur. Entom. **Sur une Tachinaire Parasite de la Larve de** *Phytonomus posticus,* **Gyll.**—*Bull. Soc. Vulg. Zool. Agric., Bordeaux,* xix, no. 11–12, November–December 1920, pp. 116–121.

Tachinids have previously been observed parasitising the larvae of several species of Chrysomelids, including *Crioceris, Galerucella, Lina, Gastrophysa, Cassida,* etc., and new hosts are continually being recorded. The apodous larvae of *Hypera* (*Phytonomus*), which were most probably originally subterranean or inhabitants of galleries and were then parasitised exclusively by Hymenoptera, have adapted themselves to the leaves of clover and lucerne, and are therefore exposed to the attack of Tachinids. One instance has in fact been observed of a larva of *Hypera variabilis,* Hbst. (*Phytonomus posticus,* Gyll.) being parasitised by a Tachinid that unfortunately died after completing its larval development and emerging from the body of its host. It seemed to be closely allied to, if not identical with, *Tachina impotens,* Rond.

TRAVERS (W. C.). **Report of Dusting Investigations.**—*Trans. Peninsula Hort. Soc.* [*Delaware*], ix, no. 3, 1920, pp. 39–44. (Abstract in *Expt. Sta. Record, Washington, D.C.*, xliii, no. 8, December 1920, p. 743.)

Co-operative dusting experiments were conducted in 1919 on the Eastern shore of Maryland, using a dust mixture of 85 per cent. sulphur and 15 per cent. lead arsenate in dusting apples, peaches, and strawberries. As compared with a lime-sulphur spray, dusting was fairly satisfactory in controlling insects, but was far from satisfactory in controlling apple diseases. It failed to control peach scab and curculio [*Conotrachelus nenuphar*], but was successful in controlling brown rot. The dust killed the weevils, but not until after they had punctured the fruit. The cost of dusting was greater than that of spraying, both with apples and peaches.

Dusting experiments for the control of the strawberry weevil [*Anthonomus signatus*] were highly successful and profitable, a mixture of 85 per cent. sulphur and 15 per cent. lead arsenate giving the best results.

LEACH (B. R.) & ROBERTS (J. W.). **The Control of the Codling Moth and Apple Scab in Delaware.**—*Trans. Peninsula Hort. Soc.* [*Delaware*] 1920, pp. 14–22. (Abstract in *Expt. Sta. Record, Washington, D.C.*, xliii, no. 8, December 1920, p. 743.)

A comparative test of dusting and spraying indicated that the dusting of apples is not advisable in Delaware, since the dust does not control codling moth [*Cydia pomonella*] or apple scab as efficiently as the spray. The combination of calcium arsenate and lime-sulphur used as a spray controlled the codling moth as well as lead arsenate and lime-sulphur. Where calcium arsenate is used, however, hydrated lime should be added to avoid injury to the foliage. The spray gun compared favourably with the spray rod in the control of codling moth, and if operated properly, good results can be secured by its use. A spraying schedule is given, that is believed to be the best suited for the control of codling moth and apple scab in Delaware.

BERTHELOT (A.). **A new Insecticide and Anti-fungoid Mixture for Vines.**—*Rev. Vitic., Paris,* li, no. 1321, 23rd October 1919, pp. 266–267. (Abstract in *Mthly. Bull. Agric. Intell. Plant Dis., Rome,* xi, no. 1, January 1920, pp. 143–144.) [Received 8th January 1921.]

For the simultaneous control of insect and fungus pests on the vine, and to avoid the drawbacks resulting from the use of lead, the author recommends an intimate mixture of 448 parts trisodium arsenate with 74·9 of copper sulphate, in a suitable volume of water. This yields a fairly neutral mixture. Used in increasing doses corresponding to 4, 6 and up to 8 lb. of copper arsenate per 20 gals., no scorching resulted. The adhesive properties were marked. To obtain quite satisfactory results against the vine moths [*Clysia ambiguella* and *Polychrosis botrana*] at least two applications are needed, one on the appearance of the pests and the other 8–10 days later. The strength of the mixture should be at a minimum of $\frac{2}{5}$ lb. copper arsenate per 2 gals. water.

BORZÌ (A.). *Phthorimaea operculella,* **a Microlepidopteron injurious to Potatoes in Sicily, Italy.**—*Boll. Studi Inform. R. Giard. Colon. Palermo,* v, no. 1–2, pp. 35–38. (Abstract in *Mthly. Bull. Agric. Intell. Plant Dis., Rome,* xi, no. 1, January 1920, p. 147.) [Received 8th January 1921.]

The presence of *Phthorimaea operculella,* Zell., was recently reported in potato tubers grown near Palermo [*R.A.E.*, A, vii, 426]. A description of the moth is given, with notes on its biology and on remedial measures for it.

STAUB (W.). **The Earwig** (*Forficula auricularia*) **as a Pest on Pear-Tree Leaves in Switzerland.**—*Schweiz. Obst- u. Gartenbau-Ztg., Monsingen,* no. 20, 15th October 1919, pp. 313–314, 2 figs. (Abstract in *Mthly. Bull. Agric. Intell. Plant Dis., Rome,* xi, no. 1, January 1920, p. 148.) [Received 8th January 1921.]

The earwig, *Forficula auricularia,* is recorded as doing serious injury to the foliage of a pear tree near Berne.

Barbey (A.). *Stenolechia gemmella*, **a Microlepidopteron injurious to Oaks in Switzerland.**—*Jl. Forestier Suisse, Berne*, lxx, no. 9–10, September-October 1919, pp. 129–131, 1 pl. (Abstract in *Mthly. Bull. Agric. Intell. Plant Dis., Rome*, xi, no. 1, January 1920, p. 149.) [Received 8th January 1921.]

Stenolechia gemmella, L. (*Poecilia nivea*, Han.), previously recorded in Switzerland, spread during 1919 throughout the country on *Quercus robur*. It causes thickening of the twigs for a length of 2–6 cm. at their ends, the caterpillar being found within the swelled portion. There appears to be only one generation a year.

Rohwer (S. A.). **Descriptions of new Chalcidoid Flies from Coimbatore, South India.**—*Ann. Mag. Nat. Hist., London*, vii, no. 37, January 1921, pp. 123–135, 9 figs.

The new species described include :—*Elasmus indicus*, from Coccids on *Acacia* ; *E. nephantidis*, from *Nephantis serinopa* on palm ; *Pediobopsis locustivora*, parasitic on Locustid eggs ; *Pleurotropis epilachnae*, a parasite of *Epilachna* ; *Tetrastichus okawus* from cumbu grains ; *T. ayyari* parasitic on *Chilo* ; *T. nyemitawus*, a parasite on the cholam stem maggot ; *T. coimbatorensis*, a parasite on the cholam gall fly ; and *Euryscotolinx coimbatorensis* parasitic on a miner in leaves of lablab.

Baker (A. C.). *Anuraphis longicauda*, **a new Aphid injurious to Plum Trees.**—*Proc. Biol. Soc. Washington, D.C.*, xxxiii, no. 20, 30th December 1920, pp. 93-95.

The stem-mothers of *Anuraphis longicauda* hatch about the 1st April, and begin reproducing about 24th April. Apterous viviparous females occur throughout the summer in all generations. The winged viviparous forms appear in the first generation after the stem-mother, after which they may be found throughout the season.

This species is recorded as injurious to plum trees in Virginia, Nebraska and Montana, both the twigs and leaves being attacked. The eggs are laid in the autumn on the twigs.

Bentley (G. M.). **States' Rulings in regard to Nursery and other Shipments.**—*Tennessee State Bd. Ent., Knoxville*, Bull. 32 (ix, no. 3), September 1920, 24 pp.

A list of the requirements of the various States for the shipment of nursery stock and other products, revised up to September 1920, is here given.

Osterwalder (A.). **Von Pilz zum Borkenkäfer.** [From Fungus to Bark-beetle.]—*Schweiz. Zeitschr. Obst- und Weinbau, Frauenfeld*, xxx, no. 1, 8th January 1921, pp. 6–9, 1 fig.

Examination of a prune tree, of which the upper half was infested by a small bark-beetle, *Scolytus* (*Eccoptogaster*) *rugulosus*, showed that the lower half was infested by fungi (*Fusarium* sp., *Clasterosporium* sp., and an unidentified species) that had evidently gained an entrance at the graft and had caused the death of the tree. Injury by the fungi had apparently encouraged the bark-beetle, and such a focus of beetle infestation may prove dangerous to neighbouring trees that are free from fungi.

VAYSSIÈRE (P.). **La Lutte contre les Sauterelles en Crau.**—*Rev. d'Hist. Nat. Appl., Paris*, Ière Partie, no. 12, December 1920, pp. 337–341.

The Moroccan locust, *Dociostaurus maroccanus*, began to cause apprehension in the Crau district [department of Bouches-du-Rhône] in 1917, and developed to such an extent that remedial measures were organised early in 1920. Three months' work by a defence league of the local agriculturists stopped any extension of the infestation to localities where early vegetables are grown on a large scale. The methods used were those previously tested [*R. A.E.*, A, vii, 432].

BÖRNER (—). **Über das Auftreten geflügelter Formen bei Blattläusen.** [On the Occurrence of winged Forms of Aphids.]—*Mitt. Biol. Reichsanst. Land- u. Forstwirtsch., Berlin*, no. 16, 10th and 11th Yrly. Repts., 1914 and 1915, April 1916, pp. 42–43.

The relation between the development of the food-plants and the appearance of winged generations of Aphids is briefly discussed.

BÖRNER (—) & BLUNCK (—). **Beitrage zur Kenntnis der wandernden Blattläuse Deutschlands.** [Contributions to the Knowledge of the migratory Aphids of Germany.]—*Mitt. Biol. Reichsanst. Land- u. Forstwirtsch., Berlin*, no. 16, 10th and 11th Yrly. Repts., 1914 and 1915, April 1916, pp. 25–42.

This paper on the migratory Aphids found in Germany contains a specific list of the APHIDIDAE and PEMPHIGIDAE. In each case the food-plant of the stem-mother and her progeny (the chief host) and the food-plant of the parthenogenetic generations (the intermediate host) are given.

The relation of *Myzus ribis*, L., to *M. galeopsidis*, Kalt., is discussed. In 1915, Van der Goot expressed the opinion that *M. ribis* is a migratory species, and suggested that *M. galeopsidis* was its parthenogenetic form. The senior author has succeeded in obtaining several parthenogenetic generations from the winged progeny of stem-mothers, after such progeny had been transferred to *Galeopsis*, but the differences distinguishing *M. ribis* from *M. galeopsidis* persisted in the parthenogenetic forms from red currant and from *Galeopsis*.

BÖRNER (—). **Über Blutlösende Säfte im Blattlauskörper und ihr Verhalten gegenüber Pflanzensäften.** [On the haemolytic Fluids in the Bodies of Aphids, and their Relation to Plant Juices.]—*Mitt. Biol. Reichsanst. Land- u. Forstwirtsch., Berlin*, no. 16, 10th and 11th Yrly. Repts., 1914 and 1915, April 1916, pp. 43–49.

Experiments have revealed a haemolytic fluid in the body of Aphids. Its presence has been traced in the saliva of the insects, and it apparently exists in the body before the adults commence feeding. The specific biological significance of this fluid has not yet been determined. Some of it is apparently transferred to the food-plant in the act of sucking, and may be responsible for discolouration and gall formation. The haemolytic action of the fluid becomes neutralised after being mixed with plant juices for some time.

SCHWARTZ (—) & BAUNACKE (—). **Das Auftreten der Maikäfer im Jahre 1919.** [The Occurrence of Cockchafers in 1919.]—*Mitt. Biol. Reichsanst. Land- u. Forstwirtsch., Berlin,* no. 18, 15th Yrly. Rept., 1919, October 1920, pp. 82–87, 1 map.

The occurrence of *Melolontha* in various parts of Germany during 1919, and its periodicity in each locality is discussed. The life-cycle apparently varies in certain districts from three to four years. Attention is drawn to the importance of keeping systematic records of the occurrence of these beetles in every locality with a view to organising general remedial measures.

BÖRNER (—) & BLUNCK (—). **Zur Lebensgeschichte des Rapsglanzkäfers.** [On the Life-history of *Meligethes aeneus*.]—*Mitt. Biol. Reichsanst. Land- u. Forstwirtsch., Berlin,* no. 18, 15th Yrly. Rept., 1919, October 1920, pp. 91–109, 1 fig.

The life-history of *Meligethes aeneus*, F., as studied in the neighbourhood of Naumburg, is described [*cf. R.A.E.*, A, viii, 542 ; ix, 64]. Under laboratory conditions the duration of the different stages was chiefly influenced by temperature. The feeding habits of the larvae and adult beetles are described, and their rôle as pollen-carriers is discussed.

The most important natural enemies of *M. aeneus* are the Braconids *Diospilus oleraceus, Isurgus morionellus, I. heterocerus,* and another undetermined species of this genus.

BÖRNER (—) & BLUNCK (—). **Beitrag zur Kenntnis der Kohl- und Rapserdflöhe.** [Contribution to the Knowledge of *Phyllotreta* spp. and *Psylliodes* spp.].—*Mitt. Biol. Reichsanst. Land- u. Forstwirtsch., Berlin,* no. 18, 15th Yrly. Rept., 1919, October 1920, pp. 109–119, 9 figs.

The general biology of *Phyllotreta* spp., and *Psylliodes* spp., as studied in the vicinity of Naumburg during 1919, is discussed, and the injury caused by these flea-beetles to various crops is described. Experiments in remedial measures are still in progress, the results of which will be published later.

BÖRNER (—). **Wanderungen der Johannisbeer- und Kirschenblattläuse.** [Migrations of Red Currant and Cherry Aphids.]—*Mitt. Biol. Reichsanst. Land- u. Forstwirtsch., Berlin,* no. 18, 15th Yrly. Rept., 1919, October 1920, pp. 119–120, 1 fig.

In the author's previous paper [see above] *Myzus ribis*, L., and *M. galeopsidis*, Kalt., are recorded as distinct species. Subsequent observations have confirmed this view, which is apparently in opposition to that held by Haviland [*R.A.E.*, A, vii, 371]. *M. ribis* may be considered as the Aphid of red currant and *M. galeopsidis* that of black currant, although both species may occur on several varieties of currants. *Rhopalosiphum affine*, sp. n., is described from red currant. The summer food-plants of *Myzoides cerasi*, F., include *Galium* spp.

Zacher (—). **Untersuchungen über Spinnmilben.** [Investigations on Spinning Mites.]—*Mitt. Biol. Reichsanst. Land- u. Forstwirtsch., Berlin,* no. 18, 15th Yrly. Rept., 1919, October 1920, pp. 121–130.

The existing literature on spinning mites is reviewed, and the general remedial measures and natural enemies are discussed. A list of 123 food-plants attacked by various species of *Tetranychus* is included.

Zacher (—). **Mitteilungen über Vorratsschädlinge.** [Information about Pests of Stored Food-stuffs.]—*Mitt. Biol. Reichsanst. Land- u. Forstwirtsch., Berlin,* no. 18, 15th Yrly. Rept., 1919, October 1920, pp. 130–139, 4 figs.

Endrosis lactella, Schiff., and *Borkhausenia pseudospretella,* Stn., often occur in mills and storehouses, attacking many seed products. In many parts of Germany injury to corn by *Calandra granaria* is said to be prevented by stacking fresh hay for about 4 to 6 weeks in the granaries. Experiments are now in progress to test the efficacy of this method. Experiments with fluid monochlorobenzol against *C. granaria,* L., and *C. oryzae,* L., are being continued, but have so far not given any very promising results. Attention is drawn to the apparent disappearance of *Tinea granella,* L., as a pest in Germany.

Thiem (—). **Der Frostspanner und seine Bekämpfung im Niederungsgebiet der Weichsel bei Marienwerder (Westpr.) im Herbst 1919.** [Control of *Cheimatobia brumata,* L., in the low-lying Vistula Region near Marienwerder in the Autumn of 1919.]—*Mitt. Biol. Reichsanst. Land- u. Forstwirtsch., Berlin,* no. 18, 15th Yrly. Rept., 1919, October 1920, pp. 139–142.

The occurrence of the winter moth [*Cheimatobia brumata,* L.] and the remedial measures adopted against it, including sticky bands, are described. The growing of grass round the trees is advocated as a temporary preventive measure during the time when this pest may be expected in abundance.

Scherpe (—). **Die Beeinflussung der Keimfähigkeit von Sämereien durch die Behandlung mit gasförmiger Blausäure.** [The Influence of Hydrocyanic Acid Gas on Seed Germination.]—*Mitt. Biol. Reichsanst. Land- u. Forstwirtsch., Berlin,* no. 18, 15th Yrly. Rept., 1919, October 1920, pp. 143–144.

As the result of experiments it has been found that an exposure to hydrocyanic gas sufficient to kill the pests of stored grain does not materially affect the germinating power of seed under normal conditions, but with increased humidity and longer exposure germination may be greatly retarded.

Zanon (V.). **Danni sul Cotone** (*Gossypium barbadense*) **e sulla Bämia** (*Hibiscus esculentus*) **a Bengasi, prodotti da un Nottuino** (*Earias insulana* **v.** *anthophilana*). [Injury of Cotton and *H. esculentus* at Bengasi by *E. insulana* v. *anthophilana.*]—*Riv. Agric., Parma,* xxvi, nos. 1–2, 7th–14th January 1921, pp. 5, 23–24.

Cotton and *Hibiscus esculentus* at Bengasi are attacked by *Earias insulana* var. *anthophilana,* of which a first generation of adults appears

in June from cocoons dating from the preceding November and December. A second generation occurs in August, the caterpillars of which are found up to October. If the weather is favourable, or if the rains are delayed, a third generation occurs up to December, and becomes the one that hibernates.

In Egypt it has been suggested that no Malvaceous plants should be grown within a wide radius around cotton. The author proposes, however, that *H. esculentus* should be sown very early, in order that its fruits (which are more tender, and appear earlier than those of cotton) should attract all the moths of the first generation. As soon as the eggs have been deposited, the crop should be gathered and all the plants removed, and used as forage or fibre before the adults emerge.

LEEFMANS (S.). **Het Nut van de Studie der Insekten-Parasiten voor den Landbouw.** [The Value to Agriculture of the Study of Parasites of Insects.]—*Teysmannia, Batavia,* xxxi, no. 8, 1920, pp. 357–372.

A list of the cosmopolitan genera or species of insect pests is given, with notes on their food-plants and distribution in America, Africa, and the Dutch East Indies. The conditions governing the successful introduction of parasites are enumerated. The author advises the use of polyphagous species in preference to that of monophagous ones, and deprecates the simultaneous introduction of two or more parasites of a given stage of the pest concerned. For instance, if an egg-parasite has been imported, the other introductions should be enemies of the larva, pupa or imago. An international organisation is desirable for the purpose of studying these beneficial insects systematically and biologically, and for promoting international co-operation between economic and systematic entomologists.

UYTTENBOOGAART (D. L.). **Polyphylla fullo, L.**—*Ent. Ber. Ned. Ent. Vereen., The Hague,* v, no. 117, 1st January 1921, pp. 298–300.

In July 1920 great swarms of *Polyphylla fullo* occurred at Noordwijk. Night-jars and bats destroyed large numbers of the swarming beetles, which included very few females. The latter remained quiescent on firs, poplars, and privet.

SMITS VAN BURGST (C. A. L.). *Meniscus transversostriatus,* **n. sp. (Ichn.).**—*Ent. Ber. Ned. Ent. Vereen., The Hague,* v, no. 117, 1st January 1921, pp. 300–301.

Meniscus transversostriatus, sp. n., an Ichneumonid bred from the pupa of *Pennisetia* (*Bembecia*) *hylaciformis,* Lasp., near Berlin, is described.

MOREIRA (C.). **As Brocas da Figueira cultivada.** [The Grubs of the cultivated Fig.]—*Chacaras e Quintaes, S. Paulo,* xxii, no. 6, 15th December 1920, p. 482.

In reply to an enquiry it is stated that three borers attack the cultivated fig in Brazil. One is the Pyralid, *Azochis gripusalis.* The larva of a weevil, *Heilipus bonelli,* is usually found in the axillae

of the shoots and in the fruits, while that of a Buprestid, *Colobogaster quadridentatus*, occurs in the bark of the trunk and large shoots. They may be dealt with by destroying the shoots or bark harbouring them.

MOREIRA (C.). **Uma Praga do Pomar e do Jardim.** [An Orchard and Garden Pest.]—*Chacaras e Quintaes, S. Paulo*, xxii, no. 6, 15th December 1920, p. 489.

The Melolonthid beetle, *Macrodactylus suturalis*, does much harm by feeding on the flowers of the orange, rose, vine, etc. Collection and spraying with a petroleum-soap emulsion are the measures recommended against it.

BERTHET (J. A.). **Coleopteros em Arrozal.** [Beetles in the Rice-field.]—*Bol. Agric., S. Paulo*, xix, no. 1, January 1918, pp. 66–67. [Received 18th January 1921.]

Severe injury in some rice-fields in the State of San Paulo is found to be due to a Melolonthid, probably a species of *Lachnosterna* (*Phyllophaga*). Nothing is yet known of its life-history in Brazil. No entirely practical and certain remedy has been devised against this beetle, though the larvae, pupae and adults in the ground can be killed by completely flooding the field for some days.

BERTHET (J. A.). **Folhas de Pereira atacadas e Insectos atacando Parreiras e Hortaliças.** [Injured Pear Leaves and Insects attacking Vines and Vegetables.]—*Bol. Agric., S. Paulo*, xix, no. 1, January 1918, pp. 67–68. [Received 18th January 1921.]

Material received for examination included a beetle of the genus *Macrodactylus*, infesting pear leaves; and another beetle, *Bolax flavolineatus*, from vine leaves. Spraying with Paris green is recommended against them.

A Lagarta Rosada. [The Pink Bollworm.]—*Bol. Agric., S. Paulo*, xix, no. 5–7, May-July 1918, pp. 420–425. [Received 18th January 1921.]

This notice, issued by the Secretary for Agriculture of the State of San Paulo, contains a number of recommendations for checking the spread of the cotton bollworm [*Platyedra gossypiella*].

AVERNA-SACCA (R.). **Notas sobre alguns Caracterés differenciaes entre a "Lagarta rosea" e as** "*Pyroderces.*" [Notes on some characters differentiating *Platyedra gossypiella* from *Pyroderces*.]—*Bol. Agric., S. Paulo*, xix, no. 8–12, August-December 1918, pp. 656–665, 4 figs.; and xx, no. 10–12, October-December 1919, pp. 522–569, 26 figs. [Received 18th January 1921.]

These are the first two parts of a paper dealing with anatomical characters enabling the larvae of *Platyedra gossypiella* to be distinguished from those of *Pyroderces*.

Instrucções para o Expurgo das Sementes de Algodão. Desinfecção de Sementes. [Instructions for the Cleansing of Cotton Seed. The Disinfection of Seed.]—*Bol. Agric., S. Paulo,* xx, no. 5, May 1919, pp. 138–139. [Received 18th January 1921.]

These instructions were issued in order to prevent the spread of *Platyedra* (*Pectinophora*) *gossypiella* in the State of San Paulo. A government official must be attached to all ginneries, and the seed must be constantly under his supervision. Among other measures it is required that oil mills should construct their seed stores on such lines as will prevent a spread of the pest. No seed may be planted until it has been disinfected.

As Pragas da Lavoura. [Pests of Agriculture.]—*Bol. Agric., S. Paulo*· xx, no. 5, May 1919, pp. 139–141.

Pests submitted for identification include a Pyrrhocorid bug, *Dysdercus ruficollis,* L., from cotton bolls, and locusts parasitised by a Dipteron. The former insect does not do much harm, as it appears when most of the crop has been harvested. Collection is the method advised against it.

Guedes (G.). **Os Curuquerês. Seus Lugares predilectos. Sua Extincção.** [*Alabama argillacea.* Its preferred Situations and its Destruction.]—*Bol. Agric., S. Paulo,* xx, no. 9, September 1919, pp. 431–433. [Received 18th January 1921.]

A remarkable outbreak of *Alabama argillacea* is recorded in San Paulo, the richest soils, where cotton was flourishing, being especially infested. Coffee planted among cotton also suffered severely. Paris green is the best insecticide, either as a liquid or dust-spray, the former being cheaper and easier to apply if proper care is taken.

Guedes (G.). **Extincção dos Gafanotos. Quadro synoptico.** [Locust Destruction. A synoptic Table.]—*Bol. Agric., S. Paulo,* xx, no. 9, September 1919, p. 434. [Received 18th January 1921.]

This table indicates the measures applicable against the different stages of locusts under various conditions of soil and weather.

Guedes (G.). **Relatorio sobre a Extincção de Gafanhotos.** [Report on Locust Destruction.]—*Bol. Agric., S. Paulo,* xx, no. 10–12, October-December 1919, pp. 509–519. [Received 18th January 1921.]

The work forming the subject of this report was carried out from October to December 1918. A spray containing 2 parts by volume of creoline, 4 of kerosene, and 94 of water, proved very destructive to the young hoppers. Its effect becomes apparent about an hour after spraying. A flame-thrower was also used with good results.

Averna-Sacca (R.). **Molestias da Jaboticabeira.** [Diseases of Jaboticabeira.]—*Bol. Agric., S. Paulo,* xxi, no. 1–3, January-March 1920, pp. 29–37. [Received 18th January 1921.]

An emulsion of 3 per cent. tar-oil is recommended against a scale, closely resembling *Pseudococcus grandis,* Hemp., infesting the leaves

and branches of the jaboticabeira [*Myricaria jaboticaba*], a fruit tree common in Brazil. The jet must be a powerful one, and should be applied during the dormant period; a summer spray would be ineffective.

TOWNSEND (C. H. T.). **Contra o Pulgão lanigero das Macieiras. Contra a Lagarta rosada e o Caruncho do Caule do Algodoeiro. Contra a Sauvá. Contra o Caruncho das Bananeiras.** [Measures against *Eriosoma lanigerum* on Apple; *Platyedra gossypiella* and Stem Weevil on Cotton; *Atta sexdens*; and the Banana Weevil.] —*Bol. Agric., S. Paulo*, xxi, no. 6, June 1920, pp. 370–373. [Received 12th January 1921.]

In reply to enquiries from various parts of San Paulo the measures advised against *Eriosoma lanigerum* are spraying with kerosene emulsion against the Aphids infesting the trunks of apple trees, or fumigation with a solution of carbon bisulphide in water, poured into a basin dug round the trunk, against those attacking the roots; against *Platyedra gossypiella*, the use of disinfected cotton seed, destruction of all débris, and crop rotation; against *Gasterocercodes gossypii*, the uprooting and burning of the infested cotton plants and crop rotation; against *Atta sexdens*, one litre ($1\frac{3}{4}$ pint) of a solution of sodium cyanide (1 part by weight of cyanide and 35 parts water) poured into the main gallery of the nest—the cyanide must be 96–98 per cent. pure; against the banana weevil, *Sphenophorus* sp., fumigation with carbon bisulphide, as mentioned above, care being taken to retain the fumes by covering the basin.

TRABUT (L.). **Le Ver Rose des Capsules du Cotonnier,** *Gelechia gossypiella*.—*Bull. Agric. Algér.-Tun.-Maroc., Algiers*, xxvi, no. 11–12, November–December 1920, pp. 237–238.

This article briefly describes the spread of *Platyedra* (*Gelechia*) *gossypiella* into Texas from Mexico, and the measures adopted in the United States against it [*R.A.E.*, A, vi, 543, etc.].

MASON (F. A.). **The Destruction of Stored Grain by** *Trogoderma khapra*, **Arrow. A new Pest in Great Britain.**—*Bur. Bio-Technology, Leeds*, Bull. 2, 1st January 1921, pp. 27–38, 1 fig., 1 plate.

In July 1920 a serious case of insect depredation in stored malt in a Midland brewery was found to be due to a beetle of Indian origin, *Trogoderma khapra*, Arrow. Malt placed in bins, after leaving the kiln at a temperature of 180° F. (82° C.), never fell below 110° F. (43° C.), even after twelve months' storage, though normally the central portion of the contents of a bin cools down in two to three months. On opening out the bins they were found to be swarming with beetles and larvae intermingled with the empty husks.

There does not appear to be any previous record of appreciable damage in Britain, and Arrow, who reported the appearance of this Dermestid in cargoes of wheat from Karachi and Bombay in 1917 [*R.A.E.*, A, v, 359], stated that there was no evidence that it could perpetuate itself in Europe. The case mentioned above is not an isolated one, for infested material has been obtained from other sources,

notably from the Burton district, where large stores of malt exist. There is little doubt that the presence of this beetle is due to shipments of Indian barley, which, prior to the war, was imported in large quantities for malting purposes. The only Indian barley ever used at the brewery concerned was introduced about four years previously, and the presence of numerous beetles became noticeable two years later. There is now every indication that adaptation to new surroundings has enabled this species to develop to such proportions as to became a serious economic pest.

The annual losses to stored wheat in India by this and other beetles became so serious as to lead to an investigation in 1916 [*R. A.E.*, A, v, 126]. Prior to that date nothing whatever was known of the life-history of *T. khapra*.

T. khapra measures about 3 mm. in length. The adult, which has a short life of about 10 days, has not been observed directly attacking malt corns. The eggs, averaging 35–40 in number, are deposited in 6–7 days in the furrow, or some other portion of the surface of the grain. After 6–7 days the yellowish-white larvae hatch out. It is during the larval stage that malt and other grains are attacked. The larva begins feeding on loose particles of farinaceous matter, and the exposed endosperm of broken grains, afterwards attacking whole grains by boring through the epidermis. The husk is never eaten. Some 7 or 8 moults occur in this stage. In malt the larva appears to find the strong husk the best protection during moulting, and there is every indication that once inside a grain it never leaves it so long as a particle of the endosperm remains. On breaking open an empty husk, it is usual to find one, two, or even three empty larval skins. The duration of the larval stage in England is not yet known. It is in this stage that infestation is likely to spread. The hairs with which the larva is covered readily anchor it to the clothes of workmen, and for the same reason many individuals would be retained in the meshes of the fabric of an empty sack, and these hibernate until the sack is refilled—perhaps in some other locality.

Pupation takes place in the last larval skin, which splits, but is not actually cast off. The pupa may be found among the insect débris. Frequently, however, in the case of malt the pupa is found inside the husk, along with previously cast skins ; the adult then escapes from the grain through the hole made by the larva on its entrance. Dead beetles are rarely found inside the hollow grains.

Barnes and Grove in India [*loc. cit.*] found *T. khapra* to be the most resistant species of those subjected to the action of various asphyxiating agents, even carbon dioxide proving useless from an economic point of view, owing to the ability of *T. khapra* to enter upon a hibernating stage when atmospheric oxygen fails. In any case, there are very serious objections to the use of this gas whenever ungerminated grain is involved.

In the present case perfect success was obtained by fumigation with chlorine gas, using liquid chlorine as a source, and treatment of the walls, floors, etc., with a hypochlorite solution containing 15 per cent. available chlorine. The latter was applied with a sprayer, which ensured penetration into all cracks and interstices likely to harbour the larvae. After treatment the rooms were sealed for a week.

Such a method of extermination must necessarily be carried out under the supervision of a technical chemist.

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THE REVIEW OF APPLIED ENTOMOLOGY

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de Campos Novaes (J.). **Dois bellos Parasitas das Palmeiras. i. Escaravelho que destróe Bulbos de Palmeirinhas** (*Dynasies=Megalosoma hector,* **Burm.). ii. Lagarta das Palmeiras** (*Brassolis sophorae,* **L.**). [Two beautiful Palm Pests. i. *M. hector,* destroying the Bulbs of young Palms. ii. The Palm Caterpillar, *B. sophorae.*]—*Bol. Agric., S. Paulo,* xxi, no. 1–3, January-March 1920, pp. 186–200, 6 figs. [Received 18th January 1921.]

Severe injury to the bulbs of young 3ft. palms (*Latania bourbonica*) ready for transplanting has been traced to a Dynastid beetle, *Megasoma hector,* Burm. ; three species of this genus exist in Brazil ; of these, *M. elephas,* Burm., is also recorded as a dangerous pest of *L. bourbonica.*

Brassolis sophorae, L., is a serious pest of piassava (*Orbignia racemosa*) ; it also does much harm to *Attalea regia. Cocus gerova* suffers less, and *Latania bourbonica* is immune from attack.

Contra o "Pulgão branco." [Measures against *Icerya purchasi.*]—*Bol. Agric., S. Paulo,* xxi, no. 6, June 1920, pp. 368–369.

Growers in the State of San Paulo who suspect the presence of the scale, *Icerya purchasi,* in their plantations are asked to send infested material to the State Department of Agriculture in order, if necessary, to receive colonies of the Coccinellid, *Novius cardinalis,* that have been established for this purpose [*R.A.E.,* A, viii, 405].

Grain Pests.—*Bur. Bio-Technology, Leeds,* Bull. 2, 1st January 1921, p. 52.

Samples of malt from various sources have been found to contain the following beetles :—*Calandra granaria,* L., *C. oryzae,* L., *Niptus hololeucus,* F., *Ptinus tectus,* Boield., and *Tribolium castaneum,* Hbst. The weevils are responsible for much damage. No serious injury can be ascribed either to *N. hololeucus* or to *T. castaneum.* The latter, when found in malt, appears to attack malt corns already mechanically damaged, and prefers the wheat grains and other foreign seeds with less resistant husks.

Tempany (H. A.). **Report on Operations for the Control of** *Phytalus smithi* **during the Season 1919-20.**—*Mauritius,* 1920, 4 pp.

The number of *Lachnosterna* (*Phytalus*) *smithi* captured in 1919–20 was under thirty-one millions, as compared with over seventy-one millions in the previous year, and is the lowest since 1912-13. The figures indicate that a control has been established in those areas in which the infestation originated ; it is only in the more recently invaded part of the area that the number of beetles taken is still on the increase. This view is corroborated by the results of surveys for the larvae.

The work of the parasite, *Tiphia parallela,* is probably the most important factor, but it must be supplemented by a certain amount of artificial assistance, comprising systematic collection of the adult beetles and the maintenance of conditions favourable to *T. parallela.* Unless these precautions are taken reinfestations are inevitable in districts where the parasite has disappeared with its host.

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The collection of insects by means of patrol gangs from the periphery of the infested area now forms a definite item in the system of control; this work seems to be producing the desired effect, since no extension of the infested area has been observed except at a single point, where the patrols will be strengthened in the coming season.

In certain infested areas plantations of *Cordia interrupta* were made in December, and by April they had become sufficiently established to enable *T. parallela* to be liberated with some prospect of success. Where the infestation exceeded 10,000 per acre, the usual action was taken to cause the owner to dig the larvae out of the field.

In connection with the cost of the campaign an important change has been made. The expenditure was formerly borne partly by the Government and partly by the planters, but now, by means of an export tax on sugar, the whole is transferred to the latter (Ordinance No. 2 of 1920). This will produce more funds than before, and the balance available will be devoted to the organisation of patrol collecting gangs to work inside the infested area.

In conclusion, there is no doubt that the sugar industry in Mauritius has thus been preserved from one of the worst disasters that have ever threatened its existence. The net value of the work exceeds considerably the whole cost of the Department of Agriculture since its establishment [see also *R.A.E.*, A, viii, 498, etc.].

Destruction of Agricultural Pests.—*Cyprus: Ann. Rept. Director Agric. 1919–20, Nicosia,* 1920, pp. 14–15.

Work against the vine sirividhi [*Zygaena ampelophaga*], *Eurytoma amygdali, Cydia* (*Carpocapsa*) *pomonella* and *Phthorimaea operculella* (*Lita solanella*) was continued [*R.A.E.*, A, vii, 534]. *Z. ampelophaga* and *P. operculella* have diminished considerably in numbers.

Cecidomyia ceratoniae, infesting carobs, prevails in most parts of the island, though one district, formerly heavily infested, is practically free as a result of five years' work.

Spraying has proved so successful against scale-insects on lemons that the intention of many gardeners to uproot their trees has been abandoned.

Regulations for the Introduction of Bees, Honey, and Appliances into New Zealand.—*N.Z. Jl. Agric., Wellington,* xxi, no. 5, 20th November 1920, p. 295.

Details are given of the regulations made under the Apiaries Amendment Act of 7th October 1913 with regard to the introduction of bees, honey and appliances into New Zealand.

Jepson (F. P.). **Shot-hole Borer Investigations.**—*Trop. Agric. Peradeniya,* lv, no. 6, December 1920, pp. 368–373.

An official trial of Speyer's paint mixture is described. The unpainted bushes recovered from pruning very much more quickly than the painted ones, and though infestation by shot-hole borer [*Xyleborus fornicatus*] was appreciably reduced, it is considered that in view of the extremely high cost of treatment and the insufficient benefits derived, painting should not be recommended for use on infested estates.

The question is also considered of the effect on shot-hole borer infestation of the various methods proposed for restricting the tea crop

in view of the present market depression. For example, one suggestion is to postpone indefinitely the next regular pruning, and by ceasing plucking, to allow the bushes to run up; a second is to prune in the ordinary way, but to eliminate subsequent plucking until conditions improve; while a third is to cease plucking when the next pruning becomes due, and to allow the bushes to rest and run up for any period up to six months, according to elevation.

If pruning were postponed and plucking continued, it would probably result in a complete infestation of the branches, extending later throughout the collar to the soil level. This might in some degree be prevented by the improvement in the bushes that would result from the cessation of plucking, but in the absence of the usual cultivation and manuring the extent of this is doubtful. Consequently, from the point of view of borer infestation, the suggestion that pruning should be eliminated and the tea abandoned indefinitely cannot be approved. It is urged that where estates are heavily infested, the tea should be pruned when due, although the pruning might be delayed and plucking stopped for a period not exceeding six months with less serious consequences than if pruning were postponed indefinitely. Prunings should always be burnt to prevent the emergence of the beetles. Where it is necessary temporarily to abandon tea (as opposed to ceasing plucking for a definite period), pruning should certainly precede abandonment.

Where the crop can be sufficiently reduced by fine plucking only, these points do not arise, but it will be interesting to observe whether this milder treatment of bushes will result in any resistance to borer attack; in fact, it is most desirable that the effect on the borer of any departure from the ordinary estate routine should be carefully observed.

McLaine (L. S.). **The European Corn Borer Infestation.**—*Agric. Gaz. Canada, Ottawa*, vii, no. 12, December 1920, pp. 938–939.

Field scouting, completed on 23rd October, showed that seven of the thirteen counties examined were infested with *Pyrausta nubilalis*. The two districts infested [*R. A. E.*, A, ix, 14] are both on the shore of Lake Erie, and cover 340 and 3,430 square miles respectively.

A Ministerial Order, Quarantine No. 2 (Domestic), was passed on 29th November 1920, prohibiting the movement from the specified quarantined townships to points outside of maize fodder or maize stalks, including broom corn, whether used for packing or other purposes, green sweet maize, roasting ears, maize on the cob or maize cobs. The quarantine does not apply if the products have undergone a process that eliminates the risk of their carrying *P. nubilalis*, nor to clean shelled maize or clean seed of broom corn, nor to shipments of the articles enumerated through the quarantined area on a through bill of lading, or shipments for scientific purposes by the Dominion of Ontario Departments of Agriculture. Shipments of dried seed maize for recognised exhibitions are to be passed at the point of destination by a duly appointed inspector.

Conference on Grasshopper Control.—*Agric. Gaz. Canada, Ottawa*, vii, no. 12, December 1920, pp. 967–968.

A conference on grasshopper control in the Prairie Provinces was held in Winnipeg on 8th and 9th October. Control and investigation work carried on in 1920 was reviewed, and plans made foı 1921.

In Saskatchewan the campaign was organised on a semi-military basis, so directed as to secure the action of farmers in all the affected districts. Supplies furnished within the municipality amounted to 2,720 tons of bran, 225 tons of sawdust, 112,636 gallons of molasses, 2,805 cases of lemons, 166 tons of arsenic, 34 tons of Paris green, and one barrel of amyl-acetate. The total cost, including transport, amounted to over £67,000 at par. It was estimated that 1,400,000 acres of crop were actually saved by the measures taken.

In Manitoba each municipality worked as a unit. Mixing stations, where farmers could obtain the poisoned bait readily, were established in the towns. Each farmer was responsible for the treatment of his own land and the adjoining side of the road. Waste places were dealt with by the councils. The Manitoba Government bore the cost of materials; the local councils provided for mixing and distribution. The poisoned bait distributed amounted to 1,659,100 tons. The crops saved by the treatment were valued at over £3,400,000 at par.

Over the United States border in North Dakota outbreaks occurred in some of the counties adjoining Saskatchewan. No organised control work was carried out, and the loss sustained was estimated at 16 per cent. of a total area of 300,000 acres. It was thought that 58 per cent. of the grasshoppers in the adjoining counties migrated to Canada. Control work will be put into effect in North Dakota in 1921.

During the campaign in Canada the co-operation of the federal officials was valuable, and experiments were conducted by the Entomological Branch with new poisoned baits, dusts, contact sprays and poison gas.

Another serious outbreak of grasshoppers is expected in 1921, and a representative committee has been appointed to devise definite co-operative plans against them.

Merrit Hawkes (O. A.). **Observations on the Life-history, Biology, and Genetics of the Lady-bird Beetle,** *Adalia bipunctata* **(Mulsant).**—*Proc. Zool. Soc., 1920, London*, pt. 4, December 1920, pp. 475–490.

The different varieties of *Adalia bipunctata* and the possibility of breeding and cross-breeding it are discussed. This Coccinellid feeds on nearly all species of Aphids, and its method of attacking its prey is described. The natural enemies of *A. bipunctata* include various birds, *Mantis religiosa*, and a bug, *Podisus serieventris*.

Flint (W. P.). **Further Tests of Dry Sulphur Compounds for the Control of San José Scale.**—*Bull. Illinois Nat. Hist. Survey, Urbana*, xiii, Article xiii, November 1920, pp. 339–343.

During 1919 and 1920 many tests have been made in Illinois orchards to determine the value of various commercial dry sulphur compounds in the control of San José scale [*Aspidiotus perniciosus*]. These dry sulphurs have several advantages over the commercial lime-sulphur solutions for orchard use, being easier to transport and handle, and also unaffected by frost. The materials used, the time and method of application, and the results are all shown in tables. Consistently good results were obtained throughout with 15 lb. Dow dry lime-sulphur to 50 U.S. gals. of water. Martin-Senour's dry lime-sulphur, tested only in the strength 12½ lb. to 50 U.S. gals., gave poor results, and it is evident that these materials should not be used at a strength less than 15 lb. per 50 U.S. gals.

Ehrhorn (E. M.). **Are the Agriculturists of Hawaii fortunate?**—*Hawaiian Forester & Agric., Honolulu,* xvii, no. 10, October 1920, pp. 291–294. [Received 18th January 1921.]

Hawaii is apparently comparatively free from insect pests. The necessity for continued vigilance and strict enforcement of plant quarantine regulations to maintain this condition is therefore emphasised.

Fullaway (D. T.). **Termites, or White Ants, in Hawaii.**—*Hawaiian Forester & Agriculturist, Honolulu,* xvii, no. 10, October 1920, pp. 294–301, 10 plates. [Received 18th January 1921.]

Damage by termites to wood, woodwork and wood products has increased considerably in Honolulu during recent years, and the resulting losses are causing some anxiety. The species concerned have been known as *Calotermes marginipennis*, Latr., *Neotermes castaneus*, Burm., *Cryptotermes brevis*, Wlk., and *Coptotermes intrudens*, Oshima, but it has recently been found that the three first-named have been erroneously referred to these species, and will shortly be described as new. They are borers in dry wood, while *C. intrudens* cannot survive in dry wood, but constructs nests in or near the ground. If forced to build above ground, it carries soil up for the purpose. Long tunnels through the earth are often constructed, leading to new sources of supply.

There is at present very little prospect of effective control of termites in Hawaii by natural agencies. The nests should be destroyed wherever possible by fumigation with carbon bisulphide, hydrocyanic acid gas, or fumes produced by burning arsenic and sulphur. The work of Oshima in Formosa with regard to resistant woods and to rendering other varieties of wood resistant is described [*R. A. E.*, A, viii, 301].

Ehrhorn (E. M.). **Division of Plant Inspection.**—*Hawaiian Forester & Agriculturist, Honolulu,* xvii, no. 11, November 1920, pp. 326–327.

Among packages intercepted or treated for infestation during October 1920 were daffodil bulbs from California, infested with the Syrphid, *Merodon equestris*, and pea seeds from Japan, which were fumigated on account of weevils.

Muir (F.). **The "Japanese" Beetle is Chinese.**—*Hawaiian Planters' Record, Honolulu,* xxiii, no. 6, December 1920, p. 291.

Recent investigations have shown that the Hawaiian pest that has always been regarded as *Adoretus tenuimaculatus* (Japanese beetle) is, in fact, *A. sinicus*, a beetle known from China, Formosa, Java and Timor. The true *A. tenuimaculatus* feeds and flies by night, whereas *A. sinicus* is diurnal in habit.

This shows the value of purely scientific work in economic entomology. For parasitic work it is necessary to know the native home of a pest, and an incorrect identification may direct the search for parasites to a wrong quarter of the world.

AGEE (H. P.) & SWEZEY (O. H.). **Director's Report.**—*Rept. Committee in Charge Expt. Sta. Hawaiian Sugar Plant. Assoc. for Year ending 30th September 1920, Honolulu,* 1920, pp 7–40. [Received 26th January 1921.]

The sugar-cane leafhopper [*Perkinsiella saccharicida*] has not caused many serious infestations since last year's report [*R. A.E.*, A, viii, 72] was issued. While the propagation and distribution of parasites of the leafhopper have been continued, trapping with sled traps and spraying are both proving very effective auxiliary measures. For the spray, a dilute solution of nicotine sulphate is used, and is pumped into the plant spaces where the hoppers congregate, producing from 70 to 90 per cent. mortality among the insects. Although a certain number of the parasites are bound to be destroyed, the destruction of leafhoppers is proportionately much greater. The discovery and importation of the parasite *Cyrtorhinus mundulus* from Queensland is described [*R. A.E.*, A, viii, 525].

The beetle *Anomala* [*orientalis*] is now very seldom seen, being controlled by its introduced parasite, *Scolia manilae,* which is still being distributed and is proving a very useful enemy to the rose beetle, *Adoretus* [*sinicus*].

The wireworm, *Monocrepidius exul,* has been injuring young cane in some localities. Though known as a beneficial predator of grubs and pupae of the cane borer [*Rhabdocnemis obscura*] and of grubs of *A. orientalis,* it has lately attacked the eyes and tender shoots of seed-cane, and has also been found in ratoon fields. It is thought it was primarily attracted by the presence of the Olinda beetle, *Pantomorus fulleri.* Experiments with poisons and repellents have given little promise of success, and an entomologist is proceeding to the Philippines to search for natural enemies there. The Coccinellid, *Coccinella arcuata,* and the lacewing fly, *Micromus vinaceus,* brought from Australia to combat Aphids, have been reared and liberated in large numbers, but in only one place have they been found to be established.

The New Guinea Tachinid [*Ceromasia sphenophori*] checks any serious infestation by the cane borer.

Tarsonemus bancrofti (cane blister-mite), which has been a pest of cane for many years, has recently been causing rather serious damage. The mites work under the green leaf-bases, giving rise to tiny blisters that form scabs on the internodes.

HINES (C. W.). **Diseases, Insects, and Plant Pests of the Sugar-cane in the Philippine Islands.**—*Philippine Agric. Rev., Manila,* xi, no. 4 (1918) 1920, pp. 275–277, 3 plates. [Received 25th January 1921.]

Among the pests of the sugar-cane in the Philippines the cane borer, *Diatraea saccharalis,* is the most common, but it does less harm than in other countries, owing to the control exercised by native parasites.

SCHWARZ (E. A.). U.S. Bur. Entom. **A New Scolytid Beetle from Tropical Florida.**—*Proc. Ent. Soc. Washington, D.C.*, xxii, no. 8, November 1920, pp. 222–226, 2 figs.

Dendrosinus bourreriae, sp. n., here described, was found boring in *Bourreria havanensis* in Florida. The finding of this genus in Florida indicates that *Dendrosinus globosus* may yet be rediscovered there.

CONRADI (A. F.) & BARRE (H. W.). **Orchard Spraying.**—*Clemson Agric. Coll., Clemson College, S.C.,* Extens. Circ. 17, February 1919, 8 pp. [Received 18th January 1921.]

The preparation and use of orchard sprays in South Carolina are described.

SAWYER (W. S.). **The Cranberry Rootworm Beetle** (*Rhabdopterus picipes*) **as an Apple Pest** (**Coleoptera**).—*Canad. Ent., London, Ont.,* lii, no. 12, December 1920, p. 265, 1 plate.

In June 1920 the cranberry rootworm beetle, *Rhabdopterus picipes,* Ol., was observed injuring apple fruit in the State of New York ; the foliage was not touched. After about the middle of July the beetles left apples for the foliage of Virginia creeper, dock, and wild strawberry, and disappeared about the 1st of August.

Powdered arsenate of lead (5 lb. in 100 U.S. gals. of summer strength lime-sulphur) was applied with great thoroughness, without either killing the beetles or driving them away.

McCARTHY (T.). **Banana Root Borer** (*Cosmopolites sordidus,* **Germar**).—*Agric., Gaz. N.S.W., Sydney,* xxxi, no. 12, December 1920, pp. 865–872, 2 plates, 1 fig.

An account is given of *Cosmopolites sordidus,* Germ. (banana root borer), as occurring in the Tweed River district. The stages of this weevil and its habits and life-history are described. Much stress is laid on the necessity for clean cultivation, and the trap method of catching the beetles is advocated The question of introducing the predatory Histerid, *Plaesius javanus,* from Java, is being considered, but further information regarding this enemy is required.

ILLINGWORTH (J. F.). **The Root Disease of the Banana in North Queensland.**—*Queensland Agric. Jl., Brisbane,* xiv, no. 6, December 1920, pp. 297–301, 2 plates.

Investigation among banana gardens in Cairns district, where the trees were very unhealthy and appeared to be drought-stricken, with the bunches of fruit much dwarfed, showed a heavy infestation of Nematodes at the roots. Most of the rootlets were dead or rotted off, and the larger roots showed patches of decay. The Nematodes were present in all stages, but there was little indication of fungus. The Nematode concerned, *Tylenchus* sp., is described. It is hoped that the remedial measures advocated by A. H. Benson for eelworms in general will be successful against this pest. These include dipping banana plants, prior to planting, in a 1 : 1000 solution of corrosive sublimate for two hours, and afterwards planting at various depths, of which 12 inches seemed to give the best results. It is suggested that since arsenious acid is proving effective for the destruction of white grubs in soil, and has not shown any detrimental effects upon the root system of sugar-cane, it may prove valuable for other root-destroying organisms. In testing this, the corms and the holes in which they are planted should be dusted ; and the poison should be mixed with the soil in infested fields before the sets are put in. Lime might also be tried when planting.

Gravely (F. H.). **Descriptions of Indian Beetle Larvae, iii.**—*Rec. Ind. Mus., Calcutta*, xvi, no. 4, June 1919, pp. 263–270, 1 plate, 1 fig. [Received 28th January 1921.]

In this paper Lamellicorn larvae only are dealt with. Those of *Adoretus lacustris*, Arr., and *A. versutus*, Har., are described from specimens found at Calcutta.

Carpenter (G. H.). **Injurious Insects and other Animals observed in Ireland during the years 1916, 1917, and 1918.**—*Econ. Proc. R. Dublin Soc., Dublin*, ii, no. 15, November 1920, pp. 259–272, 6 plates. [Received 28th January 1921.]

The roots of wheat were damaged by blackfly grubs (*Bibio* sp.). Cockchafer larvae, *Melolontha melolontha*, L. (*vulgaris*, F.), attacked the roots of cabbage, and those of *Psylliodes chrysocephala*, L., burrowed in the stems, the adult flea-beetles eating the leaves. *Tipula oleracea* L., attacked cabbage, cauliflower, lettuce, and beetroot, eating through the stem at ground level and devouring the leaves after the fall of the plant.

Beans and peas were attacked by a Capsid, *Lygus pabulinus*, L., which caused an arrested development in the buds and crumpling of the leaves, and against which nicotine sprays were employed. *Aphis rumicis*, L., also occurred on beans.

Potatoes were injured by *Lygus pabulinus*, *Calocoris bipunctatus*, F., and *Aphrophora alni*, F. The caterpillars of *Gortyna flavago* Schiff. (*ochracea*, Hb.), and *G.* (*Hydroecia*) *micacea*, Esp., bored in the stems ; *Tipula oleracea* attacked the stalks, and *Bibio marci*, L., damaged tubers stored in a pit.

Longitarsus parvulus, F., caused much damage to flax, the crop having to be resown in several localities.

In orchards, *Lygus pabulinus* caused serious damage to apples, but was effectively dealt with by a nicotine and soap wash. Very young apple fruit was also damaged by *Rhynchaenus* (*Orchestes*) *fagi*, L. In the instance observed, the weevils had apparently come from beech trees that overhung the apples. Loganberries were attacked by *Incurvaria* (*Lampronia*) *rubiella*, Bjerk. (raspberry shoot moth), and *Aspis uddmanniana*, L., and raspberries by the sawfly, *Fenusa pumilio*, Htg. *Contarinia pyrivora*, Riley, was observed on pears.

In gardens, the springtails, *Lipura fimetaria*, L., *L. armata*, Tulb., and *Orchesella villosa*, Geoff., attacked a number of plants. Dressings of lime and soot are useful against these soil-inhabiting Collembola. *Euxoa* (*Agrotis*) *segetum*, Schiff., attacked plants of henbane at the ground level.

Of forest insects, *Aphis abietina*, Wlk., and *Lachnus pini*, L., were abundant on spruce and pine, and caterpillars of *Poecilocampa populi*, L., were observed on silver fir, though they do not normally feed on conifers. *Sirex gigas*, L., occurred in various districts, and in some cases oviposited in young pine and larch, though breeding is carried on, as a rule, in decaying or dead trees.

Rhabdophaga saliciperda, Duf. (osier-twig gall midge) injured shoots of osier. It is advisable to cut off and burn galled shoots during the winter, and to tar the exposed surface of affected trunks and stems in February or March, so as to prevent the emergence of the midges.

The storehouse beetles, *Ptinus fur*, L., and *P. tectus*, Boield., were both observed, the former among seeds of henbane, the latter in a store of casein and also eating holes in carpets.

Other notes on some of the pests mentioned in this report were given in the previous one [*R. A.E.*, A, v, 487].

GILLETTE (C. P.) & LIST (G. M.). **Eleventh Annual Report of the State Entomologist of Colorado for the Year 1919.**—*Office State Ent., Fort Collins*, Circ. 28, August 1920, 64 pp., 10 plates, 6 figs. [Received 26th January 1921.]

An amendment has been passed to the Colorado Horticultural Inspection Act, for the purpose of extending the duties of the State entomologist, to provide a quarantine on poisonous plants and other objects, and to provide for the control of the alfalfa weevil [*Hypera variabilis*, Hbst.] and make an increased appropriation to support the work. An account is given of the inspection activities in the various counties, and of the formation of the Western Plant Quarantine Board, which consists of representatives from various States, to discuss problems in connection with quarantine and inspection. Certain recommendations are suggested to improve existing arrangements.

The pests recorded include:—*Aspidiotus perniciosus*, Comst. (San José scale), which continues to infest neglected orchards; *A. ancylus*, Putn. (Putnam scale), infesting pear, cherry and other fruit trees, and elms; *Pulvinaria innumerabilis*, Rathv. (cottony maple scale), on maple and box-elder trees in cities, which, when not sufficiently controlled by natural enemies, should be treated with kerosene emulsion; *Eriocampoides limacina*, Ratz. (pear slug), on cherry trees, which is easily controlled by lead arsenate sprays; *Eriophyes pyri*, Pag. (pear-leaf blister-mite), in apple orchards, where lime-sulphur sprays should be used just before the buds open in the spring; *Lepidosaphes ulmi* (oyster-shell scale), on ash trees, lilac, and willows; grasshoppers, which have caused unusually severe outbreaks, the chief species being *Melanoplus bivittatus*, *M. atlantis*, *M. differentialis* and *M. femur-rubrum*; *Gossyparia spuria*, Mod. (elm scale), for which elms should be sprayed with miscible oils; *Cydia* (*Carpocapsa*) *pomonella*, L. (codling moth) [*R. A.E.*, A, viii, 527]; *Loxostege sticticalis* (beet webworm) on sugar-beets and some garden crops, successfully controlled by sprays of any of the following substances to 50 U.S. gals. water—2 or 4 lb. Paris green, 2½ lb. zinc arsenite, 4 lb. magnesium arsenate, calcium arsenate or lead arsenate; *Lycophotia margaritosa* (*Peridroma saucia*, Hb.) (variegated cutworm), which it seems possible to control by poisoned bran mash, parasites reared from pupae of this moth being the Diptera, *Gonia sequax*, Will., *Archytas analis*, F., *Linnaemyia comta*, Fall., and *Chaetogaedia monticola*, Big., and the Hymenoptera, *Ephialtes sanguineipes*, Cress., *Dibrachys boucheanus*, Ratz., and *Meteorus mellinervus*, Vier.; *Tortrix* (*Archips*) *argyrospila*, Wlk. (fruit-tree leaf-roller), on elms, box-elder, and fruit trees, sprays of miscible paraffin oil giving better results than asphaltum miscible oil; and bark-beetles, such as *Scolytus rugulosus*, on cherry, peach and other fruit trees.

Work on the alfalfa weevil was continued on the same lines as in the previous year [*R. A.E.*, A, viii, 128]. The climatic conditions and nature of the infestation in 1919 are recorded, and an account is given of scouting operations. The weevil parasite, *Bathyplectes curculionis*,

obtained from Utah, is being reared and liberated, and seems to be increasing rapidly. There is one complete generation of the parasite in a year, with a partial second, and several larvae of *Hypera variabilis* may be attacked by one parasite. Dust mulching has not proved practicable, and is not recommended. The previous year's spraying results have been confirmed, and the spray, to be effective, must be applied when severe injury first becomes apparent.

The latest quarantine restrictions against the transport of lucerne, either as hay or packing, or for any other purpose, by means of which *H. variabilis* might be distributed, are given, as well as a synopsis of regulations existing in 1919.

LIST (G. M.). **The European Elm Scale** (*Gossyparia spuria,* **Modeer.**)—*Office State Ent., Colorado, Fort Collins,* Circ. 29, August 1920, 12 pp., 4 plates. [Received 26th January 1921.]

In Colorado the European elm scale, *Gossyparia spuria,* Mod., confines its attacks almost entirely to the American elm, probably because the latter is the species most generally grown in the districts infested. It may be classed among the most destructive pests in Colorado. The partly grown larvae hibernate in the crevices of the bark. They suck the sap in spring. The males emerge early in June and die after mating. The females are mature at the end of June, and soon begin oviposition, the eggs hatching almost immediately. In 1920 the first young were seen on 24th June. They migrate to the leaves, where they feed on the underside until hibernation begins in autumn.

Spraying with miscible oil, 1 part to 15 of water, has given almost perfect control. Judicious pruning and the removal of many trees in places where they are overcrowded are also important points.

ZUBER (N. D.). **Division of Orchard and Nursery Inspection.**—*11th Ann. Rept. Commiss. Agric. Texas, Austin,* 1st September 1918, pp. 45–53. [Received 26th January 1921.]

Infestations of cottony cushion scale [*Icerya purchasi*] occurred in various parts of the State. Spraying and fumigation were ineffective, but after some difficulty an importation of the vedalia beetle [*Novius cardinalis*] was successful in checking the pest.

Co-operative spraying was carried out against various orchard pests, and large quantities of poison were used against the Argentine ant [*Iridomyrmex humilis*].

SCHOLL (E. E.). **Division of Entomology.**—*11th Ann. Rept. Commiss. Agric. Texas, Austin,* 1st September 1918, pp. 54–62. [Received 26th January 1921.]

An extensive list of the insects noticed during the year is given. Among them *Typophorus viridicyaneus,* Crotch, and *Estigmene acraea,* Dru., attacked cotton. Colonies of the ant, *Pogonomyrmex barbatus,* were treated with a solution containing 1 lb. of 98 per cent. potassium cyanide to 6 U.S. gals. of water. Several applications of the poison were necessary.

Scholl (E. E.). **Pink Bollworm Division.**—*11th Ann. Rept. Commiss. Agric. Texas, Austin,* 1st September 1918, pp. 63–82. [Received 26th January 1921.]

The campaign against *Platyedra* (*Pectinophora*) *gossypiella,* Saund., in Texas, for the year ending September 1918, is described [*R. A.E.*, A, vi, 544 ; vii, 180].

Scholl (E. E.). **Report of the Chief Entomologist of the State Department of Agriculture to the State Farmers' Institute convening at Austin, Texas, 6th, 7th, 8th August, 1919.**—*Texas Dept. Agric., Austin,* Bull. 67, July-August 1919, pp. 15–21. [Received 26th January 1921.]

Insects that required special attention in Texas during 1919 included bean thrips [*Heliothrips fasciatus*], melon aphis [*Aphis gossypii*], and spring army worms that were destroying wheat and oats. Grasshoppers, pecan insects, fruit and shade tree pests and apple insects were also troublesome.

The control of pink bollworm [*Platyedra gossypiella*] is progressing satisfactorily. The situation in various localities is discussed. Essential measures are the destruction of self-sown cotton, the enforcement of regulated and non-cotton zones, the tracing of consignments of cotton that may have been infested or become contaminated, and scouting work. The organisation for these purposes is described.

Lundblad (O.). **Äpple- och Päronbladlopporna.** [The Apple and Pear Leaf-suckers.]—*Medd. Centralanst. Försöksväsendet på Jordbruksområdet,* no. 209, *Ent. Avdelingen,* no. 37, *Linköping,* 1920, 20 pp., 18 figs. [With an extract in German.]

The apple leaf-sucker, *Psylla mali,* Schmidb., is common in the southern half of Sweden, chiefly on apple, but also on *Sorbus aucuparia,* and, according to Reuter, on *Corylus,* though this is doubtful. The eggs hibernate on the branches. In spring the larvae hatch when the shoots open. In Central Sweden maturity is reached by mid-June. The Psyllid remains on the apple until autumn, mating occurring in the late summer and autumn. *P. mali* often causes severe injury. Infested apple trees are easily recognisable by the abundant honey-dew. In Sweden a 10 per cent. carbolineum emulsion is sprayed when the shoots open in spring, with the object of killing the eggs. Great care must be taken to spray at the right time, or the aim will not be attained, and even great injury may be done to the trees. Nicotine sulphate is employed against the young larvae.

The pear leaf-suckers are less harmful. Very little is known about them. *P. pyrisuga,* Först., does not appear to be rare, but is abundant only exceptionally, and important injury seldom occurs. *P. pyrisuga* hibernates in the adult stage. The eggs are laid in spring, usually on the young leaves. The larvae at first feed on the green portions of the pear tree ; later on they attack the bark of the previous year's shoots. Before the last moult the larvae again return to the leaves. These habits are undoubtedly secondary, and the larvae must originally have lived on the green portions only. The infested leaves curl and crinkle. Nicotine sulphate is recommended against this species, the young larvae being sprayed once or twice in early summer.

P. pyri, L., also occurs in Sweden, but is probably very rare. Hibernation takes place in the adult stage ; the eggs are deposited in spring. Owing to the scarcity of this species, injury by it does not appear to have been observed.

Up to the present *P. pyricola*, Först., has not been observed in Sweden.

ESCHERICH (K.). **Die Generation des grossen braunen Rüsselkäfers** (*Hylobius abietis*). **Zugleich eine Bitte um Mitarbeit.** [The Life-history of *H. abietis*. Also a Request for Co-operation.]—*Forstwissenschaftliches Centralblatt*, [*sine loco*] 1920, no. 12, pp. 425–431.

A full knowledge of the life-cycle of *Hylobius abietis* has not yet been obtained. Opinion is divided as to whether the larvae pupate immediately on reaching maturity or require a long larval rest period in order to become capable of pupating. Furthermore, it is not clear whether the young adults are capable of reproduction immediately after emergence or require a preliminary long maturing period during which they feed.

Acceptance of the first alternative in both the above cases involves the assumption of a short life-cycle (one year or less), and acceptance of the second of a life-cycle lasting about two years.

The belief in a two-year cycle is held by Ratzeburg and others. The author is in agreement with them, as a result of experiments made in 1915–1916 with breeding-logs in two districts of Bavaria differing rather markedly from one another. The following data were secured in both places :—Chief oviposition, from April to June 1915 ; chief growth-period of the larvae, ended by the end of September 1915 ; larval rest period, from October 1915 to June–July 1916 ; pupation, from July to mid-August 1916 ; and emergence of the young adults, after a 2–3 week pupal stage, from mid-August to September 1916.

The variations noticed in the size of the larvae in the summer of 1915 were compensated for in the next year, so that all the adults emerged together. On 5th September 1916 none of the logs harboured any larvae or adults.

Some of the young adults were caged in pairs ; they fed on the branches given to them but did not mate. It is therefore clear that a period of 15 months was required from egg to adult, and that if the fact that pairing did not take place in autumn be accepted, a two-year cycle obtains.

As others have made similar observations, there is no doubt that *H. abietis* is able to undergo a two-year cycle.

On the other hand, there exist actual observations of a much shorter life-cycle. In his cage experiments von Oppen found the period from egg to adult to be about 12 months. It is true that the beetles did not attain the full average size, so that Altum spoke of maturity due to necessity. Rothe (1910) observed that in localities where clearing had been done, development was still shorter in *Hylobius* in the small remainder of roots left in the ground. He also ascribed the early emergence to pupation owing to lack of food. Another short cycle (3–4 months) was observed in Alsace by Eichhoff (1882), who was thus led to suppose the occurrence of two annual generations.

The author has recently observed a short cycle of 3–4 months in the Bienwald, Rhine Palatinate, under conditions that do not appear to admit of any error.

The great difference in the duration is considered to be due to variations in temperature. In support of this theory it may be noted that the beetles were found in the superficial roots almost exposed to sunshine at atmospheric warmth. In the lower roots only larvae were found. Furthermore, on his return from the Rhine Palatinate to a colder region the author found only larvae.

It is therefore probable that the length of the life-cycle of *H. abietis* is governed by the temperature ; in warm regions, like Alsace and the Rhine Palatinate, a short period is possible. The difference in the lengths of the life-cycles is not so surprising if it be remembered that even in the case of the long period the larvae are full grown in the autumn of the first year. It is possible that pupation requires a certain degree of warmth.

A further question is whether there is also a possibility of two annual generations. If the beetle requires a long maturing period, even the short developmental period can yield only one generation. Dissection of the short-cycle females from the Bienwald showed that the ovaries were quite immature.

As regards the swarming and feeding periods, it is pointed out that, though various writers believe oviposition to be spread over the whole year, practical experience shows that there are two chief feeding periods—in the spring and autumn. Undoubtedly the female (as with *Pissodes*) can oviposit throughout the summer if fresh breeding material is available. Such conditions are found in a virgin forest, but in regulated forestry, spring is the chief oviposition period, owing to the attraction due to winter fellings. In a regulated forest it is, therefore, feasible to restrict most of the oviposition to a given period in the year.

The paper concludes with an appeal for co-operation, the chief assistance needed being a supply of infested roots with the exact date of felling.

MEYER (L.). **Casit gegen Erdflöhe.** [The Use of Casit against Flea-beetles.]—*Deutsche landw. Presse,* xlvii, 1920, p. 5. (Abstract in *Centralbl. Bakt., Parasit. u. Infektionskr., Jena,* IIte Abt., lii, no. 18–23, 6th January 1921, p. 425.)

A commercial preparation, Casit, is recommended by the author, its manufacturer, as the best remedy against flea-beetles, as it is non-poisonous and contains no arsenic. The constant use of arsenicals is considered detrimental to the fertility of the soil.

Independent testimony is given in support of this claim. This official opinion states that three applications of Casit destroyed the flea-beetles on older plants, but that for practical purposes success on young plants is more desirable, as they suffer most from the infestation.

KIEFFER (J. J.). **Une nouvelle Variété de Cécidomyie (Dipt.).**—*Bull. Soc. Ent. France, Paris,* no. 17, 10th November 1920, pp. 296–297. [Received 25th January 1921.]

A description is given of *Silvestrina silvestrii* var. *cecconiana,* n., taken in large numbers on olive fruit in Italy. The type species comes

from South Africa—from the fruit of *Olea verrucosa*, and the branches of *Morus alba* infested by *Diaspis*—and from Brazil, also from *M. alba* infested by *Diaspis*.

MANCHERON (P.). **Ennemis et Maladies de la Betterave à Sucre.**—*Rev. Agric. Afr. Nord, Algiers,* xix, no. 77, 21st January 1921, pp. 56–58.

The insect pests of sugar-beet mentioned are *Atomaria linearis*, common in the whole of North Africa; the larvae of *Melolontha* and *Agriotes*; *Gryllotalpa*; Nematodes; *Haltica*, common in Algeria, where it also attacks vines; and *Silpha*. Nematodes are considered to be the most important.

HABERMEHL (—). **Beiträge zur Kenntnis der palaearktischen Ichneumonidenfauna.** [Contributions to the Knowledge of the Palaearctic Ichneumonid Fauna.]—*Zeitschr. wiss. Insektenbiol., Berlin,* xvi, no. 3–4, 31st December 1920, pp. 63–69.

This is an addendum to the paper under the same title already noticed [*R. A.E.*, A, ix, 36].

ESCHERICH (K.). **Angewandte Entomologie.** [Applied Entomology.]—Reprint from *Aus der Natur*, xvii, no. 1, pp. 7–10. [Received 28th January 1921.]

An impression exists that the systematic determination of an injurious species is the duty of the zoologist, whereas combative measures come within the province of the agriculturist or agricultural botanist. This idea must be combated energetically. All the striking successes in pest control throughout the world have been achieved by applied zoologists or applied entomologists. The reason why German forestry has been so successful is that from the beginning zoologists have studied the forest insects. On the other hand, pest control in German agriculture has suffered because of the erroneous idea mentioned above.

This article also pleads for thorough co-operation between zoologists, botanists, chemists, soil-experts, and practical agriculturists. Such co-operation is necessary if agricultural pests are to be mastered.

MIÈGE (E.). **Action de la Chloropicrine sur la Faculté germinative des Graines.**—*C. R. hebdom. Acad. Sci., Paris,* clxxii, no. 3, 17th January 1921, pp. 170–173.

Observations made to test the action of chloropicrin on the germination of plants show that the effect varies with the kind of plant treated, as well as with the strength and length of treatment. Whilst leguminous plants are practically immune to the action of the gas, hemp, beetroot, and especially cereals, are greatly affected. The germinative power of wheat may be reduced by at least 30 per cent. as a result.

MARCHAL (P.). **Utilisation des Coccinelles contre les Insectes nuisibles aux Cultures dans le Midi de la France.**—*C. R. hebdom. Acad. Sci., Paris,* clxxii, no. 2, 10th January 1921, pp. 105–107.

Colonies of *Cryptolaemus montrouzieri*, Muls., predaceous on *Pseudococcus* spp., have been bred and liberated from the insectarium at

Mentone. This Coccinellid has now become established in the south of France. Colonies have also been sent to Algeria and Italy.

FONZES-DIACON (—). **La Toxicité des Métaux.**—*Progrès Agric. & Vitic., Montpellier*, lxxv, no. 4, 23rd January 1921, pp. 90–92.

Ordinary metals are not in themselves poisonous, owing to the fact that they are insoluble in body secretions and pass through the organism without affecting it. Metals become poisonous when they form soluble combinations ; verdigris is an example of this. Not all soluble copper salts, however, are toxic to the same degree. Copper sulphate (SO_4Cu) is composed of the ions SO_4 and Cu, and a solution of copper sulphate that is only slightly ionised is only slightly toxic. Furthermore, if the particles of copper are not present as free ions they are not poisonous. It is not quite correct, therefore, to speak of the toxicity of copper ; a better expression would be " the toxicity of salts containing free ions of copper." The copper salts commonly used by vine-growers are of the latter class, and this explains their toxicity.

DICKERSON (E. L.) & WEISS (H. B.). **The Insects of the Evening Primroses in New Jersey.**—*Jl. N. Y. Ent. Soc., Lancaster, Pa.*, xxviii, no. 1, March 1920, pp. 32–74, 3 plates.

Descriptions, with brief notes on the life-history, of 17 species of insects attacking evening primrose (*Oenothera*) in New Jersey are given, as well as a list of over 80 other species found associated with this plant.

CHAMBERLIN (W. J.). **Notes on Two little-known wood-boring Beetles,** *Chrysobothris sylvania*, **Fall, and** *Melasis rufipennis*, **Horn (Buprestidae, Elateridae).**—*Jl. N. Y. Ent. Soc., Lancaster, Pa.*, xxviii, no. 2, June 1920, pp. 151–157, 2 plates.

The eggs of *Chrysobothris sylvania*, Fall, are deposited in the crevices of the bark of Douglas fir [*Pseudotsuga taxifolia*] in April and May. The larvae bore through the bark and cambium into the wood during the summer, autumn and winter. Pupation occurs in March or April in the sapwood, and lasts 2 to 3 weeks. The first adults were seen on 16th April. The natural enemies of this beetle include three undescribed Ichneumonids and the Tarsonemid mite, *Pediculoides ventricosus*, Newp.

Melasis rufipennis, Horn, attacks grand fir (*Abies grandis*) and white fir (*Abies concolor*). All stages were found in April, and observations indicate that the larval stage lasts more than a year. Although one tree was heavily infested for 3 years and a great many beetles emerged, there was no indication of reinfestation of trees near by. No eggs were found. This species occurs in Washington, Oregon and Nevada.

GIBSON (A.) & MCLAINE (L. S.). **The European Corn Borer** (*Pyrausta nubilalis*, **Hb.**).—*Canada : Dept. Agric., Ent. Branch, Ottawa*, Crop Protection Leaflet no. 13, 24th September 1920, 3 pp. [Received 1st February 1921.]

Pyrausta nubilalis, which has recently been discovered in Ontario [*R. A. E.*, A, ix, 14], has so far only been found infesting maize. The nature of the injury and the usual remedial measures are briefly described.

Ministerial Order quarantining certain Areas on Account of the European Corn Borer and restricting the Movement of Corn and Corn Products in said Areas. Notice of Quarantine no. 2 (Domestic). —*Canada: Dept. Agric., Ent. Branch, Ottawa,* 29th November 1920, 2 pp. [Received 1st February 1921.]

As a result of the occurrence of *Pyrausta nubilalis*, Hb., in Ontario, a quarantine measure was passed prohibiting the transportation of maize fodder, maize stalks, including broom maize, whether used for packing or other purposes, green sweet maize, roasting ears, maize on the cob, or maize cobs from any of the enumerated townships in the Province to points outside them, with certain necessary exceptions. This quarantine was to take effect on 29th November 1920.

HEWITT (C. G.). **Report of the Dominion Entomologist and Consulting Zoologist for the two years ending 31st March 1919.**—*Canada: Dept. Agric., Ottawa,* 1920, 23 pp., 1 fig. [Received 1st February 1921.]

As a result of the inspection of foreign nursery stock several species of Coccids, Aphids, Lepidoptera and other potential foreign pests were intercepted, as well as living egg-masses of *Hyponomeuta malinellus* (ermine moth) in a shipment of apple seedlings from France. Owing to careful scouting for and destruction of the winter webs of the brown-tail moth [*Nygmia phaeorrhoea*], the situation in Nova Scotia and New Brunswick can be regarded as satisfactory on the whole. The field work was greatly assisted through the Governments of these Provinces supplying half the number of inspectors required each winter. No signs of brown-tail or gipsy moth [*Porthetria dispar*] were found in the counties of Quebec during an inspection made in November 1916.

The work of controlling *Hyphantria textor* (fall webworm) has been in progress for seven years. An unusually serious outbreak in the Lower Fraser valley in British Columbia should afford valuable data for investigations.

The outbreak of *Malacosoma disstria* (forest tent caterpillar) in New Brunswick and Nova Scotia has apparently subsided, but studies are being continued in Alberta, where a severe outbreak has occurred, and where the usual parasites appear to be entirely absent.

A severe outbreak of the spruce budworm (*Tortrix fumiferana*) on Douglas fir in British Columbia provided good material for investigation of the parasites of the later stages of this moth. Several colonies of the predaceous mite, *Hemisarcoptes malus*, were liberated in British Columbia at points where *Lepidosaphes ulmi* (oyster-shell scale) is a serious pest. The area of investigation on the natural control of *Hemerocampa leucostigma* (white-marked tussock moth) has been extended to include the whole of eastern Canada. *Compsilura concinnata* has now been successfully established against it, and *Apanteles lacteicolor* is distributed in several counties. *Calosoma sycophanta* has been liberated in Victoria, B.C., for the control of an oak looper, *Ellopia* sp. In 1917 field work was begun with a view to studying the relation of *Lachnosterna* spp. to their natural and cultural environment, but owing to shortage of assistance, this work has been temporarily discontinued.

Against *Phorbia brassicae* (cabbage root maggot) promising results were obtained with bichloride of mercury. Cutworms were most abundant in western Canada during 1917 and 1918, *Euxoa ochrogaster* and *Feltia venerabilis* doing considerable damage in gardens. Wheat and oats were attacked by *Sidemia devastatrix* (glassy cutworm) and cabbages and turnips by *Agrotis ypsilon*. *Cephus cinctus* (western wheat-stem sawfly) caused extensive damage to wheat in Manitoba and Saskatchewan. Investigations on Oscinid flies affecting western grain and grasses have been continued, and much valuable information has been secured regarding the life-histories and bionomics of several important species.

Other insects recorded are *Loxostege sticticalis* (sugar-beet webworm); *Macrosiphum granarium* (grain aphis); *Phorbia fusciceps* (seed-corn maggot), causing injury to beans and seed corn in eastern Canada; *Itonida tritici* (wheat midge); *Harmolita* (*Isosoma*) *tritici* (wheat joint worm); wireworms injurious to potatoes; *Entomoscelis adonidis*, on turnips, cabbages, etc.; *Epitrix cucumeris* (potato flea-beetle), on potatoes and tomatos, particularly in New Brunswick; *Macrobasis unicolor* (grey blister-beetle), on potatoes; *Perrisia* (*Dasyneura*) *leguminicola* (clover-seed midge), seriously affecting clover seed production in Ontario; the alfalfa-seed Chalcid [*Bruchophagus funebris*], injuring 50 per cent. of the crop in certain localities of British Columbia; and *Neocerata* (*Dasyneura*) *rhodophaga* (rose midge), very destructive to outdoor roses in Ontario.

The insects affecting fruit crops included :— *Anthonomus quadrigibbus* (apple curculio), against which lime-sulphur and calcium arsenate sprays proved effective; *Rhagoletis pomonella* (apple maggot); *Schizura concinna* (red-humped apple caterpillar); *Hyphantria cunea*; *Conotrachelus nenuphar*; *Myzus cerasi* (black cherry aphis), of which red pepper grass (*Lepidium apatelum*) appears to be the alternative food-plant; *Psylla pyricola* (pear psylla), the life-history of which has been further studied; *Polychrosis viteana* (grape-vine moth), which is of minor importance under Ontario conditions; *Anarsia lineatella*, the most serious pest of peaches in British Columbia, the life-history of which received special attention; *Aristotelia fragariae*; and *Aegeria* (*Synanthedon*) *rutilans*.

Insects affecting forest and shade trees included *Tortrix* (*Harmaloga*) *fumiferana* (spruce budworm); *Pityokteines sparsus*, Lec., and *Pissodes dubius*, Rand., associated with balsam disease. Experimental work on the control of *Agrilus anxius* (bronze birch borer), *Cyllene robiniae*, *Kaliosysphinga dohrni*, *Argyresthia thuiella*, *Diplotaxis* spp., *Lophyrus lecontei*, and *Phyllorycter* (*Lithocolletis*) sp., affecting oaks, was also undertaken. The life-histories of *Diapheromera femorata* on oak and basswood and *Prionoxystus macmurtrei* on oak were also investigated. *Dryocoetes confusus* (balsam bark-beetle) and *Pissodes strobi* (white pine weevil) caused serious injury during 1917 and 1918, as did *Tortrix conflictana* on poplars and *Hemerocampa vetusta* var. *gulosa*, on Douglas fir. *Argyroploce* (*Olethreutes*) *duplex* was less destructive than in previous years.

Owing to the reported discovery of certain mites in Canadian grain in England, a study of the conditions affecting grain from the time of harvest until loaded at the seaboard was undertaken, and the results show that under normal conditions the infestation of grain does not take place in Canada to a noticeable extent. *Ephestia kühniella* was found sparingly in accumulations of wheat in empty grain boats, and

one serious infestation by *Tyroglyphus farinae* was discovered. Cargoes of grain from Australia were heavily infested with *Calandra oryzae, Laemophloeus ferrugineus* and *Tribolium castaneum* (*ferrugineum*). The Chalcid, *Aplastomorpha pratti,* was also found in wheat.

Macaroni was especially damaged by *Calandra granaria* in Vancouver, and the bean weevil [*Bruchus* sp.] occurred in seed beans in Quebec.

WADE (J. S.). U.S. Bur. Ent. **Notes on Ecology of Injurious Tenebrionidae (Col.).**—*Ent. News, Philadelphia, Pa.,* xxxii, no. 1, January 1921, pp. 1–6.

Tenebrionid larvae are becoming yearly more destructive to newly sown wheat and other grain in the semi-arid regions of the middle and western United States. The most injurious species belong to the genera *Eleodes, Embaphion, Blapstinus,* and *Asida.* Owing to the destruction of native grasses and other food-plants, species of closely related genera may become dangerous pests. The injury is caused by the larvae destroying the newly sown grain before or during germination in the autumn. The factors affecting the distribution of these beetles are briefly outlined, and it is considered that a carefully worked out system of crop rotation will prove to be one of the best remedial measures. As the adults frequently hide under piles of Russian thistle (*Salsola kali* var. *tenuifolia*) and common thistle (*Cirsium lanceolatum*), their numbers may be greatly reduced by the destruction of all such weeds. Paper is one of the favourite shelters for adults, and is suggested as a cover for poison baits. Although heavy pasturage appears to reduce the number of insects, serious damage often follows when cereal crops are planted on old pasture land or on adjacent land. The presence of cattle in moderate numbers apparently favours the increase of *Eleodes* spp. While infested fields may contain several species, occasional areas contain a majority of a single one. As a result of the complexity of distribution, it is urged that a more careful study of the similar habits of different species must be made over an extensive and varied territory before trustworthy remedial measures can be advocated.

BRAUN (A. F.). **Notes on Microlepidoptera, with Descriptions of New Species.**—*Ent. News, Philadelphia, Pa.,* xxxii, no. 1, January 1921, pp. 8–18.

Heliozela aesella, Chamb., has only been found on *Vitis cordifolia* in the vicinity of Cincinnati, but elsewhere it produces galls on various species of grapes. The moths appear towards the end of April and early May ; the galls develop at the beginning of June, and the larvae are mature about the middle of that month. There is only one generation a year. The larvae of *Argyresthia undulatella,* Chamb., mine in the inner bark of the main trunk and branches of red elm (*Ulmus fulva*) ; the cocoons are spun early in April in a crevice of the bark.

The new species described include :—*Telphusa agrifolia* on California live oak (*Quercus agrifolia*) in California ; *Recurvaria ceanothiella,* the larvae of which mine the leaves of *Ceanothus divaricatus* in California, the adult moths appearing from April to May ; and *C. duplicis,* the larvae mining in seeds of *Aster* spp. and other Compositae.

LATHROP (F. H.) & BLACK (A. B.). **The Western Peach and Prune Root Borer** (*Sanninoidea opalescens*, **Edw.**).—*3rd Crop Pest & Hortic. Rept., 1915–20, Oregon Agric. Expt. Sta., Corvallis,* 10th January 1921, pp. 59–70, 1 plate.

Aegeria (*Sanninoidea*) *opalescens*, Edw. (western peach and prune root borer) is the most serious pest of prunes in Oregon. It is probably a native moth, and greatly resembles in life and habits the eastern peach-tree borer [*S. exitiosa*]. Several kinds of stone fruits are attacked, almonds, peach, apricot, and prune being preferred. Hibernation occurs in the larval stage, the larvae being more or less active during warm periods, and leaving their tunnels in the bark for the gum and frass around the base of the tree. With the approach of spring they become more active and spin cocoons, from which adults emerge during the latter half of June. Oviposition begins about 1st July, unhealthy trees being preferred, though healthy trees also are frequently attacked. Each female produces from 300 to 800 eggs; these hatch within ten days, the young larvae tunnelling in the bark, and later in the inner bark and cambium. There is only one generation in a year, but owing to the extended oviposition period, larvae of all sizes may be found in the tree at almost any season.

Many larvae fail to mature, disease attacking a large percentage. A parasite, *Itamoplex tejonensis*, destroys about three per cent. of the pupae. Many experiments in artificial control, carried out during 1916–20, are recorded in detail. The old method of digging the larvae from their tunnels is the most reliable yet known; this should be done before 1st July and in autumn after 1st September. Applications of asphaltum, tanglefoot, etc., to the base of the tree are not recommended. Tree protectors, when properly applied, give good results, but are not recommended, as they are apt to stimulate root rot. Whitewash treatments have been found beneficial, a successful formula being 8 lb. quicklime, $\frac{1}{4}$ lb. lead arsenate powder, 2 lb. salt, $\frac{1}{4}$ lb. glue, 2 oz. 40 per cent. nicotine sulphate, and enough water to make into a thick paint. The soil should be removed from the base of the tree to a depth of 3 or 4 inches. The crown of the tree should be dried and brushed, and then the wash applied with a stiff brush, coating the trunk to a height of 14 to 16 inches. The soil should then be replaced. The first application should be made immediately before 1st July, and another should be given in mid-August if necessary. Naphthaline washes gave very good results in 1920, but this treatment cannot be recommended until more is known about its effect on the tree as well as its efficacy. Further investigations will be made, and these recommendations are not regarded as final.

CHILDS (L.) & LOVETT (A. L.). **Improved Sprays and Practices in Codling Moth Control.**—*3rd Crop Pest & Hortic. Rept., 1915–20, Oregon Agric. Expt. Sta., Corvallis,* 10th January 1921, pp. 71–81, 4 plates.

This paper correlates the results of recent investigations into improved methods of control of codling moth [*Cydia pomonella*]. The bulk of the information has been previously noticed [*R. A. E.*, A, viii, 372, 462].

FULTON (B. B.). **The Fruit-tree Leaf-roller. Report on Progress of Investigations.**—*3rd Crop Pest & Hortic. Rept., 1915–20, Oregon Agric. Expt. Sta., Corvallis,* 10th January 1921, pp. 82–88, 4 figs.

The fruit-tree leaf-roller [*Tortrix argyrospila*] was first observed to be destructive in Oregon in 1912, and rapidly became one of the most injurious fruit pests of the State, sometimes defoliating whole trees and spoiling two seasons' crops by preventing the formation of fruit buds. While apple is the preferred food, cherry, plum, prune and pear trees are also attacked, but seldom peaches. The oblique-banded leaf-roller [*T. rosaceana*] is frequently associated with *T. argyrospila,* but has not been known to do any serious damage. *T. argyrospila* passes more than nine months of the year in the egg-stage attached to the bark of the tree, and hatches when the buds are in the cluster stage, the young larvae generally entering the blossoms and webbing the stamens together. Later, they fasten the leaves together to form a nest. Pupation occurs within the web, the moths beginning to appear from late June to mid-July, according to the locality, the species occurring in all parts of the State. Seven different parasites have been bred from this leaf-roller, and a soldier-bug is an active predator, but these enemies are not a sufficient check. The most successful remedy as yet tried is a spray of heavy miscible oil, 8 gallons to 100, applied after the buds show green at the tip and before the blossom cluster buds begin to spread.

ROBINSON (R. H.). **Chemical and Physical Properties of the Arsenates of Lead.**—*3rd Crop Pest & Hortic. Rept., 1915–20, Oregon Agric. Expt. Sta., Corvallis,* 10th January 1921, pp. 89–94, 1 plate, 1 fig.

The results of various tests with different commercial brands of lead arsenate are given. All those tested were practically the same in chemical composition, safe in use and probably equally efficient. The present investigation into the physical properties indicates that there is an appreciable difference in the size of the particles, in the proportion of large and small particles, and their suspension qualities. The addition of a spreader seemed to cause further sub-division of clusters of arsenical particles and to hold them in suspension for a long time. An efficient spreader should also cause the drops to flatten out and spread over a larger area. Only spraying tests in the field will prove whether the addition of a spreader increases the efficacy of an arsenical spray.

LOVETT (A. L.). **The Pear Thrips** (*Taeniothrips inconsequens,* **Uzel**).—*3rd Crop Pest & Hortic. Rept., 1915–20, Oregon Agric. Expt. Sta., Corvallis,* 10th January 1921, pp. 95–102, 6 figs.

Taeniothrips inconsequens (pear thrips) was first observed in destructive numbers in Oregon in 1919, though it had probably been introduced some years previously. An account of its life-history, habits, food-plants and the injury it causes is given [*R. A.E.,* A, iii, 461, etc.]. Many spraying tests were planned for 1920, but owing to climatic conditions this thrips was not numerous, and spraying was impossible or of little value. Until thorough trials have been made in Oregon, it is proposed to adopt the spraying practices followed in British Columbia, and a spray calendar on these lines is appended.

CHAMBERLIN (W. J.). **Flat-headed Borers which attack Orchard Trees and Cane Fruits in Oregon.**—*3rd Crop Pest & Hortic. Rept., 1915–1920, Oregon Agric. Expt. Sta., Corvallis,* 10th January 1921, pp. 103–108, 1 fig.

Of the 350 odd species of Buprestids—known as flat-headed borers —that occur in the United States, over 50 are found in Oregon. The species here dealt with include *Chrysobothris femorata,* F. (flat-headed apple-tree borer), *C. mali* (Pacific flat-headed apple-tree borer) [*R. A.E.,* A, vii, 475] and *Dicerca pectorosa* (flat-headed prune-tree borer). The last-named is usually found in trees already infested with root-borers. Peach and prune trees are attacked, the native food-plant probably being wild plum. A similar species, *D. horni,* also occurs in Oregon, and has many native food-plants.

Prevention of attack by these borers is much simpler than remedies, and is largely attained by thorough cultivation, fertilisation, pruning and spraying. Injured or broken trees should always be carefully repaired and the exposed parts painted over. Wounds made in extracting borers from trees should be similarly treated. Any device that shades the trunk acts as a preventive to oviposition. Trap posts placed in the orchard and coated with a sticky substance catch some of the females when on the wing and seeking places for oviposition. Mechanical protectors in the form of burlap or heavy paper, wrapped securely around the trunks from the ground to the lowest branches, might be applied when blossoming starts, and removed late in summer. Repellents such as soft soap with caustic potash or washing soda solution may be applied with a brush when the borers begin emerging in the spring. Crude carbolic at the rate of one pint to 10 gals. of wash may be added.

FULTON (B. B.). **Grasshopper Control in Oregon.**—*3rd Crop Pest & Hortic. Rept., 1915–20, Oregon Agric. Expt. Sta., Corvallis,* 10th January 1921, pp. 109–115, 1 plate, 2 figs.

Grasshopper outbreaks of importance in Oregon are confined to the great plains of the eastern and southern parts of the State, and are due to *Camnula pellucida.* Lesser outbreaks, generally of the non-migratory species such as *Melanoplus femur-rubrum* and *M. atlantis,* occasionally occur in Western Oregon. *C. pellucida* breeds chiefly in restricted areas, generally in waste land, and *Melanoplus* spp. in or adjacent to cultivated fields. A summary is given of the grasshopper outbreaks that have occurred in the State within recent years. A species of Bombyliid is a common insect enemy of the eggs of *C. pellucida.* Where possible, the egg-beds should be ploughed over or cultivated with a disc or spring-tooth harrow, but this, as a rule, is only profitable where the ground can be sown for a crop. When this is not practicable, the young hoppers can be poisoned in the spring before they have had time to spread.

Accounts of various locust campaigns are given; in one county it is estimated that an expenditure of some £1,200 saved about £100,000 in the value of the crop. The essentials in grasshopper poisoning are active organization of the whole district under efficient leadership, perfected early enough for surveys of the egg-beds prior to actual work, estimates for the necessary materials, allowing at least 2 lb. of arsenic per acre on the egg-beds, with other materials in proportion,

and the following of proper methods of mixing and spreading the bait. These are described, and the standard formulae recommended by the United States Bureau of Entomology are given.

FULTON (B. B.). **The Alfalfa Weevil.**—*3rd Crop Pest & Hortic. Rept., 1915–1920, Oregon Agric. Expt. Sta., Corvallis,* 10th January 1921, pp. 116–118, 2 figs.

The alfalfa weevil [*Hypera variabilis*] first appeared in Oregon about 1919. An account of its life-history and habits and the remedial measures against it are described [*R. A. E.*, A, vi, 339; viii, 128, etc.]. The spray recommended is 2 lb. powdered lead arsenate to 100 U.S. gals. water with a little soap, used at the rate of 100 gals. or less per acre. This should be applied one or two weeks before the first crop is ready to be cut, or when the young larvae have become sufficiently numerous to destroy the growing tips. Experiments are being conducted in Idaho to determine the relative values of dusting and spraying as a remedy against this weevil.

LOVETT (A. L.). **The Loganberry Crown-borer** (*Bembecia marginata,* **Harris.**).—*3rd Crop Pest & Hortic. Rept., 1915–20, Oregon Agric. Expt. Sta., Corvallis,* 10th January 1921, pp. 119–120.

Pennisetia (*Bembecia*) *marginata,* Harr. (loganberry crown-borer) is one of the most commonly injurious insect pests of cane fruits in Oregon. Two seasons are passed boring in the crown of the plant. The moths are observed from August until early autumn, and deposit their eggs singly on the lower surface of the leaf margins. These hatch in from 40 to 60 days, that is, in late September or October. The young larvae crawl down the canes to the crown of the plant and tunnel under the bark below the ground surface, forming a cell that appears as a slightly raised blister on the crown. In the spring they tunnel upwards, reaching in early summer the base of one of the new season's canes, and tunnel the pith of the new cane for 10 or 12 inches. At midsummer they work their way outwards and girdle the cane beneath the bark, causing it to die. At a point below this girdle they generally tunnel out an opening to the exterior of the cane. In late autumn the borers return to the crown or the root to pass the second winter. In the succeeding spring they are mature, and again ascend a dead stub or cane, where they pupate, the moths emerging in August or later.

Sprays against the larvae are useless, as they are inside the plant, and no insecticide has as yet been found that is successful against the eggs, but as the larva twice appears above ground, the following method has been tried and has proved very successful. In early summer, when the canes are being trained up and old ones cut out, any girdled or wilted canes should be firmly grasped, twisted and pulled. The cane will sever at the girdle, often revealing a borer at the spot. A short, thick wire might be inserted into the severed stub to kill any borers there. In very severe infestations the canes should be visited again in late June, and all dead canes and stubs close to the ground should be broken off. The mature larvae that have come up for pupation will thus be destroyed.

Childs (L.). **Amounts of Spray required on Trees of different Ages in the different Applications.**—*3rd Crop Pest & Hortic. Rept., 1915–20, Oregon Agric. Expt. Sta., Corvallis,* 10th January 1921, pp. 121–122.

A lack of understanding of the amount of spray material required for trees of different ages has often been the cause of failure to check the ravages of many familiar insects and diseases. In this paper the necessity of recording and studying the average amount used per tree of every spray applied during the season is emphasized. Where this is done, it is found that the use of irregular amounts of spray is the cause of decided irregularity in insect control. In the case of autumn applications of Bordeaux mixture, where twigs, branches and trunks must be thoroughly covered, more time and material is required than for the coating of foliage and fruit in summer sprays. About 2 U.S. gals. more spray is required in the autumn on old, bearing trees than is required on the same trees in the summer. A table shows the average amount of spray per tree applied in well-sprayed orchards of different ages in Hood River Valley, where very satisfactory results have been obtained.

Lathrop (F. H.). **The Rusty Leaf Mite.**—*3rd Crop Pest & Hortic. Rept., 1915–20, Oregon Agric. Expt. Sta., Corvallis,* 10th January 1921, pp. 123–124, 1 fig.

Injury to fruit foliage in Oregon is caused by *Phyllocoptes schlectendali* (rusty leaf-mite), which is found throughout the prune, pear and apple districts. The mites hibernate in the winter beneath the bud scales, generally of apple, and when these are swelling in the spring they become active on the buds and opening leaves and continue on the foliage throughout the summer, causing curling and russeting of the leaves. Sometimes the fruit also is russeted, and cracks appear on the surface. Sulphur, either as a dust or liquid, should be used in the summer months when the mites are exposed on the foliage.

Fulton (B. B.). **Tree Crickets.**—*3rd Crop Pest & Hortic. Rept. 1915–20, Oregon Agric. Expt. Sta., Corvallis,* 10th January 1921, pp. 125–126, 1 fig.

Tree crickets [*Oecanthus* spp.] are often the cause of splitting or breaking of raspberry and loganberry canes, owing to their oviposition punctures. Raspberry cane blight fungus also frequently enters the canes at the punctures. If numerous enough to cause serious damage, the affected canes should be cut out and burnt in the autumn or spring.

General Insect Notes.—*3rd Crop Pest & Hortic. Rept., 1915–20, Oregon Agric. Expt. Sta., Corvallis,* 10th January 1921, pp. 127–130, 1 fig.

Xyleborus dispar (shot-hole borer) has been injurious to fruit trees for the past three seasons, prune and pear trees suffering most. It was found that only unhealthy trees affected with sour sap are attacked. Better cultivation and the maintenance of healthy conditions will save the trees from attack. If infestation is observed, 1 U.S. gal. soft or liquid fish-oil soap, with $\frac{1}{2}$ pint crude carbolic acid to 3 U.S. gals.

water should be applied in spring, each week for three weeks. *Anarsia lineatella* injures prune and peach trees, the larvae tunnelling down the terminal twigs and killing them, and burrowing into the young fruit, causing it to drop. Commercial lime-sulphur (1 : 8) should be used just as the buds are swelling, and if properly applied, is invariably successful. Bud weevils were the cause of injury on filbert, pear, prune and other fruit trees, the buds being eaten out as they developed. Mechanical protectors should be tied about the trunks of the trees to prevent the ascent of the weevils, most of which cannot fly, and of climbing cutworms, which are sometimes responsible for similar injury. *Monophadnus* (*Monophadnoides*) *rubi* (raspberry sawfly) caused much defoliation of loganberries and raspberries. The adults appear at blossoming time and oviposit within the tissue of the leaf. Sprays of 1 lb. lead arsenate to 25 U.S. gals. of water, applied just after blossoming to the lower surface of the leaf, are an effective remedy. The Cerambycids, *Xylocrius cribratus* and *X. agassizi* (black gooseberry borers), have seriously injured commercial gooseberry plantations in one county and are also gooseberry pests in California. The beetles appear in late summer, and oviposit on gooseberry stems. The larvae tunnel down the stems to the roots, mature and transform into adults in the following summer. Evidently the life-history varies, as adult beetles have been found in the root tunnels in April. The only method of control at present known is to cut out and burn infested bushes. Great care should be taken to plant only clean stock. *Crioceris asparagi* (asparagus beetle) has been the cause of considerable loss to asparagus growers. Beans show injury that is apparently due to *Epilachna corrupta*, Muls. (bean ladybird). *Lygus gibbosus* (carrot beetle) tunnels into the surface soil about the roots of sunflowers, cutting off and devouring the roots and thus killing the plants. As the beetles breed in humus and decaying matter, compost and manure piles and similar breeding-places should be destroyed wherever possible. The Meloids or blister-beetles, *Epicauta pardalis*, Lec., and *E. puncticollis*, Mann., damage maize and potatoes, and *Cantharis cyanipennis*, Say, does serious injury to lucerne. Poison sprays will kill these beetles, but are seldom practicable under field conditions. Windrows of straw should be piled along the windward side of infested fields, and these should be set on fire after dusk, the beetles being driven with the wind into the fire by persons walking backwards and forwards across the field, sweeping the tops of the plants.

McKay (M. B.). **A Serious Nematode Disease of Strawberry and Clover in Oregon.**—*3rd Crop Pest & Hortic. Rept., 1915–20, Oregon Agric. Expt. Sta., Corvallis,* 10th January 1921, pp. 139–144, 2 plates.

A serious disease of strawberry and clover in Oregon is caused by the Nematode *Tylenchus dipsaci*, Kühn. The females produce many eggs, and the larvae reach maturity in about four weeks, so that increase is rapid, and several generations occur in a season. The larvae work chiefly in the stems and leaves of the plants, producing galls in strawberry, and in clover causing the stems to become swollen and stunted. In hyacinths the disease is known as ring disease. A list of the known food-plants, both in the United States and elsewhere, is given.

The chief method of control is proper rotation of non-susceptible crops, and clean cultivation. For two, or preferably three years, such non-susceptible crops as maize, cowpeas, soy beans, millet, sunflower, tomato, asparagus, cabbage, broccoli, lettuce, cantaloupes and celery should be grown, and should be planted in rows to enable weeds to be kept down. In Oregon an effort is being made to eradicate the pest from strawberry fields by cutting out all diseased plants. No strawberry plants should be distributed from infested beds, owing to the danger of carrying the pest in the soil about the plants.

ILLINGWORTH (J. F.). **Monthly Notes on Grubs and other Cane Pests. (Third Series.)**—*Queensland Bur. Sugar Expt. Sta., Div. Ent., Brisbane,* Bull. 10, 1920, 39 pp., 3 figs.

ILLINGWORTH (J. F.). **Work of the Division of Entomology.**—*20th Ann. Rept. Queensland Bur. Sugar Expt. Sta., Brisbane,* 1920, pp. 35–39.

These papers collate the information published elsewhere in connection with sugar-cane grub investigations, most of which has already been noticed [*R.A.E.*, A, viii, 62, 79, 132, 164, 465; ix, 9].

MUESEBECK (C. F. W.). **A Revision of the North American Species of Ichneumon-flies belonging to the Genus** *Apanteles*.—*Proc. U.S. Nat. Mus., Washington, D.C.,* lviii, no. 2349, pp. 483–576.

Of the 164 Ichneumonids dealt with in this paper, 36 are described as new and include:—*Apanteles bucculatricis*, from *Bucculatrix* on *Quercus agrifolia*; *A. paranthrenidis*, from *Paranthrene robiniae*, H. Edw.; *A. thurberiae*, from bollworms on *Thurberia thespesioides*; *A. phthorimaeae* from *Phthorimaea glochinella*, Z.; *A. acrobasidis*, from *Acrobasis caryae*, Grote, on walnut; *A. californicus*, from *Recurvaria milleri*, Busck; *A. diatraeae* from *Diatraea saccharalis*, F.; *A. papaipemae*, from *Papaipema maritima*, Bird, and *P. nebris*, Gn.; *A. scutellaris*, from *Phthorimaea operculella*, Z.; *A. plathypenae*, from *Plathypena scabra*, F.; *A. autographae*, from *Phytometra* (*Autographa*) *brassicae*, Riley; *A. pyralidis*, from various Pyralids, including *Loxostege similalis*, Gn.; *A. anisotae*, from *Anisota senatoria*, S. & A.; *A. nitens*, from *Feltia aeneipennis*, Grote; and *A. tmetocerae*, from *Eucosma* (*Tmetocera*) *ocellana*, Schiff. A key to the 164 species of *Apanteles* is given with a list of the hosts of this genus.

CUSHMAN (R. A.). U.S. Bur. Ent. **The North American Ichneumon-flies of the Tribe Ephialtini.**—*Proc. U.S. Nat. Mus., Washington, D.C.,* lviii, no. 2340, 1920, pp. 327–362, 1 plate, 1 fig.

Keys are given to the North American genera and subgenera of EPHIALTINI and to the species of *Ephialtes* and *Apechthis*.

The new species include *Apechthis pacificus*, a parasite of *Notolophus antiqua*, L., in Oregon. A list is given of the species arranged according to their hosts.

Leach (B. R.). U.S. Bur. Ent. **A Study of the Behaviour of Carbon Disulfide when injected into the Soil and its Value as a Control for the Root-form of the Woolly Apple Aphis.**—*Soil Science, New Brunswick, N.Y.*, x, no. 6, December 1920, pp. 421–452, 2 plates, 8 figs.

The methods adopted during these investigations are described. The amount of injury caused to apple trees by the employment of a dose sufficient to rid them of woolly aphis [*Eriosoma lanigerum*] prohibits the use of carbon bisulphide as a remedy for this pest. The degree of injury to the roots depends on the diffusion of the gas in the soil, but the indirect effect of root injury upon the rest of the tree varies considerably with the season and consequent stage of seasonal growth, and is apparently due to the interference with normal transpiration.

Roebuck (A.). **Frit Fly** (*Oscinis frit*) **in relation to Blindness in Oats.**—*Ann. App. Biol., Cambridge*, vii, no. 2–3, December 1920, pp. 178–182, 1 plate.

As a result of observations made during the summer of 1919, three broods of *Oscinella* (*Oscinis*) *frit* are thought to occur on oats. A certain percentage of the intermediate brood is directly connected with blindness of spikelets. From the end of June to end of July larvae were found anywhere amongst the curled-up mass of the panicle, protected from the outside by the enclosing leaf and destroying the enclosed flowers. In some cases only the central axis and branches were left, and these presented a blanched and twisted appearance on unfurling. During 1917 this brood was also found in abundance on stems of winter wheat.

Jackson (D. J.). **Bionomics of Weevils of the Genus** *Sitones* **injurious to Leguminous Crops in Britain.**—*Ann. App. Biol., Cambridge*, vii, no. 2–3, December 1920, pp. 269–298, 6 plates, 6 figs.

Sitones lineatus, L., of which all stages are here described, is widely distributed throughout Europe. The observations of previous authors, both in England and elsewhere, are reviewed. This weevil is common throughout the British Isles, but is most destructive in the South of England. The present field observations were made at Wye, Kent, and in Ross-shire. Peas and beans are the favourite food-plants, and clover is apparently only attacked when other food-plants are not available, but the species may also be found on lucerne throughout the year. The most serious damage to beans and peas is caused by the adults in the spring when they emerge from hibernation. During the winter they may be found sheltering in long grass. The date of appearance in spring varies according to the season and the latitude —from 27th March in 1918 in Kent to the middle of May in Scotland in 1919. They feed principally on young unopened leaves of the terminal shoots of beans until the plant is ready for cutting, but the terminal shoots of peas are only attacked while the plant is small; when over a foot high the leaves near the ground are eaten. The hibernating individuals may survive until July or beginning of August; in Ross-shire a few were collected in September, but they have not been observed to live through a second winter, the length of life being

from 12 to 15 months. In Kent oviposition began in April and continued to July, the eggs being laid indiscriminately amongst the earth at the base of the plants. They hatch in about 21 days, and the larvae burrow through the earth to the roots and enter the nodules, on which they feed. The larval stage lasts about 7 weeks. Pupation occurs in a cell excavated in the soil, and lasts from 16 to 19 days, but the weevils remain in the soil 5 to 6 days longer. The first weevils emerge from the soil about July, and begin at once feeding on peas and beans. As the plants are full grown, very little damage is caused at this time. When the crop is harvested, most of the weevils disperse, but some are carried with the crops, and a few may be found in the field in midwinter. These adults do not oviposit until the following spring, a fact that has been conclusively proved by a study of the reproductive organs, details of which are described.

The natural enemies include birds, a mite (*Trombidium* sp.) and the Braconids, *Perilitus rutilus*, Nees, *Pygostolus falcatus*, Nees, and *Liophron muricatus*, Hal. var. *nigra*. The fungus, *Botrytis bassiana*, is always fatal to the weevils, and experimentally it has also proved fatal to pupae and larvae in all stages. Successful experiments have been made in infecting the weevils with spores of this fungus, and this work is to be continued on a larger scale.

A key is given to the British species of the genus *Sitones* found on leguminous crops, adapted, with some alterations, from Fowler.

RITCHIE (W.). **The Structure, Bionomics and Economic Importance of** *Saperda carcharias*, **Linn., "The large Poplar Longhorn."**—*Ann. App. Biol., Cambridge*, vii, no. 2–3, December 1920, pp. 299–343, 4 plates, 25 figs.

The observations here described were made chiefly in Aberdeenshire, where *Saperda carcharias*, L., attacks *Populus tremula*. In captivity this beetle feeds readily on many varieties of poplar, and eggs were laid on black Italian poplar (*P. monilifera*). A description is given of the various stages as well as of the characters of the genus *Saperda*. The adults appear from July to mid-August. The eggs are laid in the stems of healthy trees, a smooth portion of the bark near the base of the tree being generally selected and the eggs inserted into a slit. If the bast layer is thin, such as on stems between five and twelve years old, the eggs are placed between the cambium and sapwood, but in older trunks they are found between the tissues of the bast. One egg only is inserted in each incision, but in badly infested trees the incisions may be very close together. The first winter is passed in the egg-stage, which lasts about 10½ months. The larvae on emerging, about July, feed on the tissues immediately surrounding them. They then cut into the sapwood in an horizontal direction for about ½ to 1 inch and turn downwards, gnawing gradually deeper until the centre of the stem is reached. On reaching the root portion, the larva turns and tunnels up the centre, a hole being bored on the way through the sapwood and bast for the emergence of the adult. The tunnel is continued up the centre of the stem to a height of about 2 ft. Excluding the hibernation period, the larval gallery takes about 8½ months to complete. Hibernation occurs from about October to March. The larval period lasts about 23 months, and the total life-cycle in Scotland is about 4 years. If many larvae are at work in one stem their galleries may be very irregular, and they often develop

cannibalistic habits. Though the chief damage to the tree is done by the larvae, the incisions made by the adults for oviposition afford ready access to parasitic fungi.

All infested trees, whether grown in natural regeneration or in artificial plantations, should be cut down and burned by the end of June before the beetles emerge. All beetles should be collected between July and August. In the case of a few trees oviposition may be largely prevented by ensheathing the lowermost portions of the stem for about 18 inches above the ground-level with a close mesh netting or by coating with some repellent [*R. A.E.*, A, vii, 301].

The natural enemies of this beetle include an Ichneumonid, but no fungus was observed to infest it.

OSHIMA (M.). **Formosan Termites and Methods of preventing their Damage.**—*Hawaiian Forester & Agriculturist, Honolulu,* xvii, nos. 11 and 12, November and December 1920, pp. 314–321 and 346–355.

This is an extract from a paper already noticed [*R. A.E.*, A, viii, 301].

EHRHORN (E. M.). **Division of Plant Inspection.**—*Hawaiian Forester & Agriculturist, Honolulu,* xvii, no. 12, December 1920, pp. 359–361.

The pests intercepted during November 1920 included ants, *Prenolepis* sp., found in yams from Japan, and Lepidopterous larvae in beans from Fiji.

PICARD (F.). **Les Microlépidoptères de la Vigne, Pyrale, Cochylis, Eudémis.** [The Microlepidoptera of the Vine, *Sparganothis pilleriana, Clysia ambiguella* and *Polychrosis botrana.*]—*Progrès Agric. Vitic., Montpellier,* lxxvi, nos. 1, 2, 3 and 5; 2nd, 9th, 16th and 30th January 1921, pp. 8–13, 41–45, 61–69 and 115–119.

A full account is given of these three important vine pests, the information being largely collected from previous papers in the same journal. The chief morphological distinctions between these moths are described, and it is pointed out that while *Sparganothis pilleriana* has only one generation in a year, *Clysia ambiguella* has two and *Polychrosis botrana* three. The larvae of the first-named attacks chiefly the foliage, the other two the fruit only; *S. pilleriana* deposits eggs in masses on the leaves; *C. ambiguella* and *P. botrana* lay them singly on the fruit; *S. pilleriana* and *C. ambiguella* fly at night, *P. botrana* in morning and evening twilight; *S. pilleriana* hibernates as young larvae, the other two species as pupae.

This last fact has a great bearing on the winter treatments and their efficacy; it must be remembered that in the spring *S. pilleriana* emerges from the bark as a larva, while *C. ambiguella* and *P. botrana* emerge from the stock in the adult stage. The influence of various factors on the incidence of the pests is discussed; these include mildew, temperature, humidity, force and direction of the wind, nature of the

soil, variety of vine, date of harvest, rivalry of other species, and natural enemies. The insect enemies of these pests are fairly numerous, but none of them can be reared and bred in sufficient numbers to act as a control, and few of them are of any importance.

The usual remedial measures are described, the use of bait-traps being discouraged.

GARBE (J.). **La Lutte contre les Ennemis des Arbres fruitiers.** [Remedies against Fruit Tree Pests.]—*Rev. Agric. Afr. Nord, Algiers,* xix, no. 78, 28th January 1921, pp. 77–78.

The winter moth [*Cheimatobia brumata*] is one of the principal pests of orchards, and may be controlled by adhesive bands applied to the trunks. These may be prepared by thoroughly mixing, while warm, about 13½ oz. of train oil scouring, 13½ oz. of fish oil, and about 2 lb. of colophane. The method of application is described. The bands should be renewed every 8 to 10 days.

Against the woolly aphis [*Eriosoma lanigerum*] lime-sulphur sprays and kerosene emulsions are advocated, for which formulae are given.

WESTER (P. J.). **The Cultivation and Uses of Roselle.**—*Philippine Agric. Rev., Manila,* xiii, no. 2, 1920, pp. 89–99, 5 plates.

The insect enemies of roselle (*Hibiscus sabdariffa*), which is largely cultivated in the Philippines, both as an ornament and for the sake of the products derived from it, include the root-knot Nematode *Heterodera radicicola,* for which a cheap and effective remedy has not been found (it is therefore recommended that infested land should not be planted with this crop) ; *Dysdercus suturellus* (cotton-stainer), which sometimes appears on the ripening calices, but does not seem to do much harm ; Aphids, which are easily controlled by the application of tobacco dust ; and the scales, *Coccus hesperidum* and *Hemichionaspis aspidistrae.* Mealybugs cause rather serious damage, and infested plants should be torn up and burnt early in the season. In Queensland the beetles, *Nisotra breweri,* Jarv., *Lagria cyanea,* Macl., and *Rhyparida discopunctulata,* Lea, are destructive to the leaves, and may be controlled by arsenical sprays.

MERINO (G.). **The Importance of Plant Quarantine Service in the Philippines.**—*Philippine Agric. Rev., Manila,* xiii, no. 2, 1920, pp. 117–125.

A plant inspection service for the Philippines was inaugurated in 1915, in view of the necessity for preventing the entrance of further such dangerous pests as the army worms, *Prodenia litura* (*littoralis*) and *Spodoptera mauritia,* which destroy from 15 to 20 per cent. of the rice and maize in the provinces, red and black beetles, which destroy 23 per cent. of the coconut crop, and *Thosea cinereomarginata* and *Promecotheca cumingi* (coconut leaf miner), which in some cases reduce the production of coconuts by 60 per cent. This service, besides plant inspection, undertakes the work of combating insect infestations, and an advisory plant quarantine board has been formed. The general working of the plant quarantine service is described, with the method of procedure necessary for importing or exporting plants or plant products.

LEE (H. A.). **The Prevention of the Importation of Injurious Insects and Parasitic Fungi on Economic Crops from Foreign Countries.**—*Philippine Agric. Rev., Manila,* xiii, no. 2, 1920, pp. 126–127.

Numerous instances are cited of injurious pests and diseases that are not yet present in the Philippine Islands, but that would probably cause very serious losses if they ever entered them, and the necessity for a plant quarantine service to guard against their introduction is emphasized. The organisation that is in the course of formation to deal with the question is described [see preceding paper].

ALFIERI (E.). **Sopra una Specie probabilmente nuova di Afide gallecolo dell'Olmo e sui suoi Simbionti.** [A probably new Species of gallicolous Aphid of the Elm and its Symbionts.]—*Boll. Lab. Zool. Gen. Agrar. R. Scuola Sup. Agric., Portici,* xiv, 1920, pp. 18–32, 1 fig., 1 plate. [Received 6th February 1921.]

It is agreed that in Europe the following Aphids produce galls on the elm [*Ulmus campestris*] :—*Tetraneura alba,* Ratz., *T. rubra,* Licht., *T. ulmi,* De G., *Eriosoma ulmi,* Kalt., and *E. lanuginosum,* Hart. The galls ascribed to the last-named species are very different from the others, and belong to two distinct types which have been described by Massalongo. A study of these two types leads the author to believe that the closed type of gall is produced by *E. lanuginosum,* but that the open type (the second type of Massalongo) is due to a new species, which is here described as *Eriosoma inopinatum,* the differences in antenna and wing between it and *E. lanuginosum* being figured.

In Italy the fundatrix of *E. inopinatum* begins its gall at the end of April or early in May. By mid-May it is mature within the gall, and produces numerous larvae that mature in 10–12 days, so that parthenogenetic progeny of the latter are found in the gall by the end of May. This second generation increases in number and size in the second week in June. After mid-June swarming begins. During this period the winged migrants begin to deposit yellowish larvae in abundance. The author was compelled to abandon this research before discovering the food-plant chosen for this larviposition. The winged migrant does not seem to become a root-form of the elm itself.

Many symbionts of *E. inopinatum* occur within its gall, the author giving the following list :—Diptera : a Syrphid, *Pipizella heringi,* Zett., an Agromyzid, *Leucopis annulipes,* Zett., an Anthomyid, *Muscina stabulans,* Meig. Neuroptera : *Chrysopa perla,* L. Coleoptera : The Coccinellids, *Propilea quatuordecimpunctata,* L., *Adalia bipunctata,* L., var. *quadrimaculata,* Scop., *Adonia variegata,* Goez., and *Scymnus quadripustulatus,* F. Rhynchota : *Anthocoris nemoralis,* Fall. Dermaptera : *Forficula auricularia,* L., and *F. biguttata,* F. Two undetermined Hymenoptera were also found, one being a parasite of the fundatrix and the other, an Ichneumonid, a parasite of *C. perla.*

SILVESTRI (F.). **La Mosca della Brionia,** *Gonyglossum wiedemanni,* **Meig. (Diptera, Trypaneidae).**—[The Bryony Fly, *G. wiedemanni.*]—*Boll. Lab. Zool. Gen. Agrar. R. Scuola Sup. Agric., Portici,* xiv. 1920, pp. 205–215, 4 figs. [Received 6th February 1921.]

The Trypetid fly, *Gonyglossum wiedemanni,* Meig., is redescribed in all its stages. It has been recorded in England, France, Germany, Austria and Italy, and it lives in the berries of *Bryonia alba* and

B. dioica. Hibernation occurs in the pupal stage, which at Portici terminates between the end of April and the end of May. The proportion of females to males is as 13 to 17.

The eggs are deposited in immature berries, only the epidermis and a portion of the pulp surrounding the seeds being left by the larva. After reaching full development the larva pierces the skin and drops to the ground, into which it burrows for pupation. At Portici the first mature larvae were observed on 2nd June and the last on 8th August. The first pupa was seen on 9th June. Development from egg to pupa takes about 40 days.

Opius testaceus, Wesm., a Braconid parasite of the larva, is redescribed from Portici; hitherto it had only been recorded from Belgium and England. The author thinks that confirmation is required for the opinion expressed by Marshall that *Laccoparys villaenovae,* Vollnh., is a synonym of *O. testaceus.*

SILVESTRI (F.). **Contribuzione alla Conoscenza dei Parassiti delle Ova del Grilletto canterino** (*Oecanthus pellucens,* **Scop., Orthoptera, Achetidae).** [A Contribution to the Knowledge of the Parasites of the Eggs of *O. pellucens.*]—*Boll. Lab. Zool. Gen. Agrar. R. Scuola Sup. Agric., Portici,* xiv, 1920, pp. 219–250, 20 figs. [Received 6th February 1921.]

Salvi's description of *Oecanthus pellucens,* Scop., is quoted, and the author states that this tree-cricket oviposits in the stems of many herbaceous plants with a soft pith, including *Centaurea dissecta* and *Daucus carota.* Salvi and Perris have also found the eggs in the twigs of *Rubus.* In central and southern Italy *O. pellucens* oviposits from the second half of August to October, and the larvae hatch in mid-June in the following year.

From stems containing the eggs the following Chalcids were bred:—*Archirileya inopinata,* gen. et sp. n., *Eurytoma oophaga,* sp. n., and *Tetrastichus ovivorax,* sp. n.

A. inopinata has from one to two generations a year. The first develops in the eggs of *Cicada plebeja* and *Tettigia orni,* though those of *O. pellucens* may also be attacked, and the second in those of *O. pellucens.* *E. oophaga* appears to be the species recorded by Perris from France as *E. vagabunda,* Gir. Its distribution probably coincides with that of *O. pellucens.* It has two generations, with perhaps a partial third. *T. ovivorax* has at least two generations, both of which parasitise the eggs of *O. pellucens.*

Parasitism by three other Chalcids, *Tetrastichus percaudatus,* sp. n., *T. dispar,* sp. n., and *Eurytoma phaenacidis,* Mayr, was not established.

GRANDI (G.). **Descrizione di una nuova** *Blastophaga* **a Maschi completamente astomi e di una nuova** *Julianella* **di Costarica.** [Description of a new *Blastophaga* with mouthless Males and of a new *Julianella,* both from Costa Rica.)—*Boll. Lab. Zool. Gen. Agrar. R. Scuola Sup. Agric., Portici,* xiv, 1920, pp. 251–264, 7 figs. [Received 6th February 1921.]

The two new AGAONINAE from Costa Rica here described are *Blastophaga* (*Julianella*) *torresi* from *Ficus velutina,* and *B. astoma* from *Ficus crassiuscula.*

SILVESTRI (F.). **Contribuzione alla Conoscenza dei Termitidi e Termitofili dell'Africa occidentale. II. Termitofili. Parte seconda.** [A Contribution to the Knowledge of the Termites and Termitophiles of Western Africa. II. Termitophiles. Second Part.]—*Boll. Lab. Zool. Gen. Agrar. R. Scuola Sup. Agric., Portici,* xiv, 1920, pp. 265–319, 32 figs. [Received 6th February 1921.]

In this continuation of an earlier paper on termitophilous insects [*R.A.E.*, A, vii, 142] an annotated list of Diptera, Lepidoptera and Coleoptera associated with termites in Western Africa is given. There is also a list of many species of termites found in the nests of other species; this association seems quite accidental, and neither sought for nor necessary for any given species. The author never found any Rhynchota, but in the Island of Principe, *Termitaphis subafra,* Silv., has been taken from nests of *Rhinotermes putorius,* Sjöst.

ZACHER (F.). **Schaben als Schädlinge in Gewächshäusern.** [Cockroaches as Greenhouse Pests.]—*Gartenflora* [*Berlin*], 1920, no. 13–14, pp. 165–168, 2 figs. [Received 7th February 1921.]

The cockroaches, *Blattella* (*Phyllodromia*) *germanica,* L., and *Blatta orientalis,* L., are domestic pests in Germany, where a few other species, including *Aphlebia maculata,* Schäffer, *A. punctata,* Mg., *Ectobia lapponica,* L., and *E. livida,* F., are found in the forests.

As a general rule cockroaches, especially the larger species, need warmth and are confined to the tropics, but a few, such as *Periplaneta americana,* L., and *P. australasiae,* F., are regularly found in Germany and are not infrequently noxious pests in greenhouses. Besides these, *Pycnoscelis surinamensis,* L., has occurred in greenhouses in the Botanical Garden at Dahlem (Berlin), not having been known in Germany as a greenhouse pest prior to 1918. In 1910 Raffil recorded this species from London, and in 1917 Zappe reported it on roses in Connecticut [*R.A.E.*, A, vi, 460]. Like Zappe, the author found females only, so that it is probable that parthenogenetic reproduction is possible.

Two other species, *Nauphoeta cinerea,* Ol., and *N. brazzae,* Bol., have been observed in London, and the former has also reached Hamburg from East Africa.

Owing to their hidden mode of life, cockroaches are difficult to combat, although their habit of cleaning themselves by means of their mouth-parts may be utilised. For this reason the best results are attained by placing a poisonous dust or liquid near their retreats. A mixture of equal parts of sodium fluoride and flour has been said to give excellent results. A weaker mixture, consisting of one part sodium fluoride to four of flour proved fatal in experimental work. Pyrethrum is less effective, and only the purest and freshest quality is lethal. The remedies advised by Zappe [*loc. cit.*] are quoted. Raffil advocates closing cracks in the walls, especially near hot pipes, with cement. At Kew, tins filled with rape oil have proved highly efficient traps.

GARRETSEN (A. J.). ***Helopeltis* op Sumatra.** [***Helopeltis* in Sumatra.**]—*De Thee, Buitenzorg,* i, no. 3, September 1920, pp. 75–76. [Received 7th February 1921.]

The presence of *Helopeltis antonii* and *H. theivora* on the east coast of Sumatra has been definitely established. No loss to the tea crop has resulted as yet, and in advocating great watchfulness and the

immediate application of remedial measures in cases of infestation, it is pointed out that the latter does not necessarily make tea-growing unremunerative.

On one estate *H. antonii* occurred mainly on tea beneath *Sesbania aegyptiaca,* and the parts most attacked were those in the shade of these plants, which were themselves infested with this and other bugs. There was no infestation in neighbouring plantations where the tea was grown beneath *Tephrosia.* After felling and burning the *Sesbania* and uprooting the stumps, collection was prosecuted very energetically, and one-and-a-half weeks later the *Helopeltis* had entirely disappeared, a considerable loss being thus prevented.

LEEFMANS (S.). **Aanteekeningen over Voedsterplanten van** *Helopeltis.* [Notes on the Food-plants of *Helopeltis.*]—*De Thee, Buitenzorg,* i, no. 3, September 1920, pp. 77–78, 2 plates. [Received 7th February 1921.]

Adults and eggs of *Helopeltis antonii* var. *bradyi* are recorded on *Fuchsia coccinea,* growing at an altitude of approximately 4,800 feet, but no larvae could be found. Though tea was attacked under laboratory conditions, plants growing about 300 feet away from the *Fuchsia* remained uninfested. Similar observations have led observers to suppose that *Helopeltis* is not a fixed pest of tea, but the author does not agree, his view being that too little is known about these Capsids, especially as regards the inheritance of morphological and bionomic characters in the various species or races. For this reason research into the genetics of these bugs would be justified, quite as much so as the quest for remedies.

In his garden at Buitenzorg, Dr. Rant found infestation on *Begonia, Cuphea micropetala,* and *Wormia suffruticosa,* so that these must be added to the list of food-plants. He also noticed that the upper branches of nangka [*Artocarpus*] were first attacked, and then the lower branches, the insects finally migrating to *Begonia* and the other plants mentioned. This leads the author to think that the reason why *Helopeltis* has not been observed in virgin forests may be the fact that infestation occurs among the tall trees, and that *Helopeltis* only occasionally descends from such elevated situations. An examination of any injury met with when felling in a virgin forest is therefore desirable.

Circular on *Helopeltis* **in Sumatra.**—*De Thee, Buitenzorg,* i, no. 3, September 1920, pp. 82–83. [Received 7th February 1921.]

This circular of the Director of Agriculture, Industry and Commerce for the Dutch East Indies draws attention to the fact that *Helopeltis theivora* and *H. antonii* are now known to occur in Sumatra, and points out the danger attending attempts to conceal the presence of these pests on tea estates.

HANSEN (D.). **The Work of the Huntley Reclamation Project Experiment Farm [Osborn, Montana] in 1918. Sugar Beet Root Louse Control.**—*U.S. Dept. Agric., Washington, D.C.,* Dept. Circ. 86, April 1920, pp. 16–17.

Experiments in connection with the control of the sugar-beet root-louse [*Pemphigus betae*] by means of increased irrigation were continued in 1918 [*R.A.E.,* A, iii, 578; vii, 141]. The results show

that irrespective of the number of irrigations, infestation was too slight to affect the yield, but the general climatic conditions were probably unfavourable to the development of this Aphid.

HUNTER (W. D.). **The Fight Against the Pink Bollworm in the United States.**—*U.S. Dept. Agric. Yearbook 1919, Washington, D.C.*, 1920, pp. 355—368, 4 figs. [Received 10th February 1921.]

The work and quarantine regulations in connection with the infestation of pink bollworm [*Platyedra gossypiella*] in Texas are reviewed [*R.A.E.*,A, vi, 543; viii, 13, 244, etc.]. The work is to be continued along the original lines, and a period of not less than two years is recommended for the maintenance of non-cotton zones. The remedial measures must be applied to over 22,000 square miles of territory in the United States, if this pest is to be stamped out. The general situation is rather encouraging, and it is possible that the methods employed will prevent the permanent establishment of *P. gossypiella* in the country.

HAVILAND (M. D.). **Preliminary Note on a Cynipid Hyperparasite of Aphides.**—*Proc. Camb. Phil. Soc., Cambridge*, xx, no. 2, 1920, pp. 235–238.

The Cynipid hyperparasites studied during these observations belong to the genus *Charips* (*Allotria*); and *Macrosiphum urticae*, Kalt., parasitised by *Aphidius ervi*, Hal., was the Aphid used for breeding purposes. Although until about twelve hours before death there is apparently no external sign that the Aphid is parasitised, yet *Charips* sp. only oviposits in Aphids containing *Aphidius* sp. and unerringly rejects unparasitised individuals. Larvae of *Aphidius* in the third or early in the fourth instar are generally chosen for oviposition, though eggs may be laid in those of the second instar. In captivity oviposition was occasionally parthenogenetic. The eggs hatch in about three days. Three or four larvae may be found in the same host, but presumably only one reaches maturity. The duration of the first-stage larva varies from two to four days. During the fourth stage the larva is almost fully fed, and makes its way out through the host's thorax; during the next twelve hours it devours the remains of the host. Metamorphosis occurs within the cocoon already woven by the *Aphidius* inside the Aphid. Pupation lasts from three to four weeks, and the total period of development probably from 30 to 35 days. The adults after emerging feed on the honey-dew secreted by the Aphids. Although these hyperparasites check the destruction of the Aphids by *Aphidius*, they are not considered of great economic importance. The Cynipid and its Braconid host are also liable to attack by Chalcid and Proctotrupid hyperparasites, especially in the later broods.

HAVILAND (M. D.). **On the Bionomics and Development of** *Lygocerus testaceimanus*, **Kieffer, and** *Lygocerus cameroni*, **Kieffer (Proctotrypoidea—Ceraphronidae), Parasites of** *Aphidius* (**Braconidae**).—*Qtrly Jl. Microscop. Sci., London*, lxv, no. 1, December 1920, pp. 101–127, 18 figs.

The various stages of *Lygocerus testaceimanus* and *L. cameroni* are described. The bionomics of these hyperparasites of *Aphidius* have already been noticed [*R.A.E.*, A, viii, 146].

DOWNES (W.). **The Tree-hoppers of British Columbia.**—*Proc. Ent. Soc. Brit. Columbia, Victoria, B.C.*, Syst. Ser. no. 14, March 1919 (1920), pp. 17–19. [Received 16 February 1921.]

The Membracids dealt with are :—*Ceresa basalis*, Wlk., on willow, golden-rod and herbaceous plants ; *C. bubalus*, F., causing serious damage to orchard trees by the slits made in the bark for oviposition ; *Stictocephala pacifica*, Van D., on willow ; *Platycotis quadrivittata*, Say, on oak, probably hibernating in the adult stage ; *Glossonotus univittatus*, Harr., on willow (*Salix scouleriana*) ; and *Campylenchia latipes*, Say, on lucerne and sweet clover.

HUDSON (G. V.). **Notes on the Hosts of certain Parasitic Hymenoptera.** —*N.Z. Jl. Sci. & Techn., Wellington*, iii, no. 4, November 1920, pp. 222–223.

The Ichneumonid, *Degithina buchanani*, Cam., is recorded as parasitic in the larvae of several species of *Porina*, having been reared from *P. cervinata* and *P. umbraculata*. The male parasite is rare, but the female has a remarkable habit of hibernating gregariously in crevices between the weather-boarding of houses and in similar situations. Before houses were built in the country, the insects frequently occurred under the large scales on the bark of standing rimu-trees (*Dacrydium cupressinum*). As the caterpillars of *Porina* feed on the roots of grasses in winter, the female Ichneumonid must be active at least during mild intervals, in order to oviposit on its host.

MILLER (D.). **Insects Inhabiting the Gum Fluid of** *Phormium*.—*N.Z. Jl. Agric., Wellington*, xxi, no. 6, 20th December 1920, pp. 335–337, 7 figs.

The gum fluid of native flax (*Phormium tenax*) is the natural breeding habitat of the Syrphids, *Lepidomyia decessum* and *Syrphus ropalus*, and a Chironomid. It was thought that these larvae might be responsible for yellow-leaf disease of the plant, but observations show that they are of universal occurrence, both in diseased and healthy plants. All stages of the larvae of *L. decessum* may be found throughout the year, and the larval period is apparently of considerable duration, as individuals were observed from April to October before they pupated. Pupation occurs on the dead leaves of *Phormium*.

The larvae of *Syrphus ropalus* are predaceous and attack many insects, including *Xanthorhoe praefectata* (flax-grub) and grubs of *Venusia verriculata* on cabbage trees (*Cordyline australis*).

PARROTT (P. J.). **Seasonable Facts of special Interest on Orchard Spraying.**—*Proc. 1st Ann. Meeting N.Y. Hortic. Soc.*, 1919, pp. 51–63. [Received 10th February, 1921.]

Owing to the low temperatures of the winter of 1917-18, orchard pests were far less conspicuous than normally. The tussock moth [*Hemerocampa*] and the codling moth [*Cydia pomonella*] were the most conspicuous pests, and redbugs [*Lygidea*] and apple maggots [*Rhagoletis pomonella*] were injurious in apple orchards. The pear slug [*Eriocampoides limacina*] was surprisingly abundant, but San José scale [*Aspidiotus perniciosus*] and tent caterpillars [*Malacosoma*] declined in numbers. It is generally understood that insects can better withstand seasons with steady low temperatures than those

with rapid and wide variations in temperature. The cold seemed to have no detrimental influence on the eggs of the green apple aphis (*Aphis pomi*), which was very abundant in some apple orchards, reaching its maximum destructiveness about 15th July. Spraying was begun too late to be really effective. The conclusions reached as a result of organised effort to combat this Aphid are that infestation is generally severest in plantings with considerable succulent growth on trunks and large limbs, or where the orchards adjoined or were interplanted with young trees. In regions where this pest is annually destructive, or where infestation is expected, reliance should be placed on a delayed dormant treatment with lime-sulphur and nicotine sulphate, with a supplementary spraying during midsummer of nicotine sulphate and soap if the Aphids threaten to develop in destructive numbers.

While lime-sulphur solution and lead arsenate will probably continue to form the bulk of the insecticides to be applied to fruit trees, a good deal of interest is being aroused in calcium arsenate, which has frequently been found a satisfactory substitute for lead arsenate and is economical in use. There is much, however, yet to learn with respect to its manufacture and its effect on orchards under New York conditions. Only reliable brands should be used, and manufacturers' directions should be followed; for the commoner chewing insects the spray recommended is $\frac{3}{4}$lb. dry calcium arsenate to 50 U.S. gals. Bordeaux mixture or lime-sulphur solution with 2 or 3 lb. of slaked lime.

The use and abuse of spray-guns is discussed. The use of dry substitutes for lime-sulphur solution is increasing, and attention is called to several points to be considered in using the various sulphides and polysulphides now on the market. A table shows the dilution required for several of the more widely advertised dry sulphur preparations. Soda and potash-sulphide sprays have proved in the station experiments more caustic to opening buds and leaves than lime-sulphur or barium-sulphur preparations. As a general rule, arsenicals should not be used with the former sprays, owing to foliage injury.

Against San José scale the sulphides and polysulphides of different bases, when used with similar ratios of sulphur, have proved equally effective. Dilutions of one-half the strength at present recommended showed a high rate of toxicity. In view of the high price of lime-sulphur, a dilution of one gallon of the concentrate to 15 gals. of water may be relied upon where the spraying can be done thoroughly or where the pest is not serious.

FELT (E. P.). **European Corn Borer.**—*Proc. 1st Ann. Meeting N.Y. Hortic. Soc.*, 1919, pp. 216–218. [Received 10th February 1921.]

An account is given of the European corn borer [*Pyrausta nubilalis*] as occurring in Massachusetts [*R.A.E.*, A, vii, 224; ix, 132, etc.], and the danger of its spread is emphasised.

CROSBY (C. R.). **The Control of the Apple Redbugs.**—*Proc. 1st Ann. Meeting N.Y. Hortic. Soc.*, 1919, pp. 220–221. [Received 10th February 1921.]

The most injurious species of redbug in New York State is *Lygidea mendax*, which usually hatches while the trees are in blossom. The

best time for spraying is as soon as possible after the bugs hatch, or when about three-quarters of the petals have fallen, and the most effective spray is 1 pint of Blackleaf 40 to 100 gals. of spray material, which is generally dilute lime-sulphur solution and lead arsenate. Many tests were made with dust materials against this pest; the most effective being a 40 per cent. tobacco, 10 per cent. lead arsenate and 50 per cent. sulphur mixture. When the poison is applied with a hand duster, the redbugs fall from the trees, but apparently are not killed, though many die through failure to return; applied with a power duster, the material seemed to kill the bugs, though a few were left alive on the trees. The larger bugs seem to be more resistant to the effect of tobacco dust than the younger ones.

PARROTT (P. J.). **The Apple Maggot.**—*Proc. 1st Ann. Meeting N.Y. Hortic. Soc.*, 1919, pp. 222–224, 3 figs. [Received 10th February 1921.]

An account is given of the injury to apples in the Hudson River valley by the apple maggot [*Rhagoletis pomonella*], which is particularly injurious in neglected orchards. Remedial measures that have been previously noticed are recommended [*R.A.E.*, A, vii, 212], but more information is needed as to the value of these in the locality under consideration.

PARROTT (P. J.). **Higher Reaches in Insect Control.**—*Proc. 2nd Ann. Meeting N.Y. Hortic. Soc.*, 1920, pp. 26–35, 3 figs. [Received 10th February 1921.]

The benefits of delayed dormant treatment are discussed and many hints are given on safe and efficient methods in spraying. Among new insecticides, chief attention is directed to the merits of calcium arsenate and the dry substitutes for lime-sulphur solution. Growers are warned not to use the former without having thoroughly tested its safety for orchard use; it is considered that for the present it should be regarded as a substitute for Paris green, and for spraying potatoes, cabbage and other field crops it will probably be of great value. The insecticidal properties of lime as used against leaf-hoppers on apple trees, have proved particularly effective against the pear psylla [*Psylla pyricola*], lime-sulphur (1 : 8) being used as the cluster buds are separating at the tips, with nicotine sulphate as the petals fall. For midsummer spraying against the nymphs, lime and copper sulphate without tobacco extract are recommended. China and slip clays, when applied as a thick coating on pear leaves, are nearly, if not quite, as efficient as thick lime wash. Unfortunately, clays are not at present manufactured in a convenient form for the grower. Plum curculio [*Conotrachelus nenuphar*] has done considerable damage to apples, the punctures made when the apples are forming causing many of them to drop. The attacks by this weevil seem to appear in cycles, the injury always being most severe in neglected orchards. Spraying and cultural practices are the remedies advocated. For leaf-hoppers experiments indicate that Bordeaux mixture containing lead arsenate is the best protection, if both sides of the leaves are thoroughly covered; this requires more nozzles, or a better arrangement of nozzles than is found in the usual potato spray.

The cabbage aphis [*Brevicoryne brassicae*] has been more destructive than at any time since 1913. Experiments demonstrate the dwarfing effects of attack by this pest and the possibility of greatly reducing its numbers by thorough spraying.

WHETZEL (H. H.). **The Present Status of Dusting.**—*Proc. 2nd Ann. Meeting N.Y. Hortic. Soc.*, 1920, pp. 45–75. [Received 10th February 1921.]

In an attempt to solve the much discussed question of dusting versus liquid spraying for insect pests and diseases of fruit trees, the author has gathered together a mass of data gained experimentally in various parts of the United States and Canada, and under very varied climatic and other conditions. The experimental evidence thus obtained clearly indicates that dusting is quite as effective in the control of apple scab and codling moth [*Cydia pomonella*] as is spraying. The opinion of many growers who have been experimenting in dusting is quoted. There are, however, certain accessory problems that require to be solved before dusting can be generally adopted in place of spraying. One is the finding of an effective contact dust that will kill sucking insects in general. One or two such preparations show promise, but cannot yet be adopted for general use. There still remains the problem of an effective dust for the San José scale [*Aspidiotus perniciosus*]. Dusting machinery will undoubtedly be greatly improved in the next few years, and other points, such as the best time of day for operating, will be determined by experience.

While not attempting to analyse the question of the comparative cost of dusting and spraying, the author is of opinion that in view of the lighter labour involved, dusting will prove the cheaper practice of the two.

STAHL (C. F.). **Studies on the Life-history and Habits of the Beet Leaf-hopper (Preliminary Paper).**—*Jl. Agric. Res., Washington, D.C.*, xx, no. 4, 15th November 1920, pp. 245–252, 2 plates. [Received 12th February 1921.]

The various stages of *Eutettix tenella*, Baker (beet leaf-hopper) are described, and the life and seasonal history as studied in Idaho and California are discussed [*cf. R.A.E.*, A, vi, 480].

The most important egg-parasite is *Polynema eutettixi*, Gir., which has at least nine generations a year, the complete cycle from adult to adult covering about 35 days. Other egg-parasites are the hyper-parasite, *Abbella subflava*, Gir., and *Anagrus giraulti*, Crawf. The parasites of the nymphs and adults have already been noticed [*loc. cit.* iii, 557].

COTTON (R. T.). **Rice Weevil** (*Calandra*) *Sitophilus oryza.*—*Jl. Agric. Res., Washington, D.C.*, xx, no. 6, 15th December 1920, pp. 409–422, 1 plate.

During 1918 *Calandra* (*Sitophilus*) *oryzae* caused serious damage to maize in the southern United States, involving a loss of approximately £6,000,000. The losses due to this weevil are particularly severe in tropical countries where the weather conditions admit of breeding all the year round. In Florida all stages of the weevil are

active throughout the year, and there are usually about seven full generations annually; six from April to November, and one from December to March. Hibernation does not occur. The life-cycle from egg to adult averages 28 days. The adults appear on maize in the field as soon as it reaches the roasting-ear stage. When the grain has become firm, eggs are deposited in all parts of it accessible to the weevil. In shelled maize the majority of eggs are deposited in the soft germ; in the field damaged or poorly developed shucks are preferred. In warm weather about 8 to 10 eggs are laid per day. The rate of oviposition decreases in cold weather, and as the weevils get older. The maximum number laid by one female was 576 during 149 days. The eggs hatch in from three to five days, but all stages are prolonged in cold weather. There are four larval instars, each lasting on an average four days. Pupation lasts five days, but during the winter the adults may remain a month in the grain before emerging. The average length of life of the adults is from three to six months. The predaceous mite, *Pediculoides ventricosus*, Newp., attacks all immature stages of *C. oryzae*, which is also parasitised by the Hymenoptera, *Cercocephala elegans*, Westw., *Aplastomorpha vandinei*, Tuck. (*Neocatolaccus australiensis*, Gir.), *Catolaccus incertus*, Ashm., *Meraporus requisitus*, Tuck., *M. calandrae*, How., and *M. utibilis*, Tuck., the last two being stated by Gahan to be identical with *Lariophagus distinguendus*, Foerst.

WILLARD (H. F.). *Opius fletcheri* **as a Parasite of the Melon Fly in Hawaii.**—*Jl. Agric. Res., Washington, D.C.*, xx, no. 6, 15th December 1920, pp. 423–438, 13 figs.

The activities of *Opius fletcheri*, Silv., since its introduction into Hawaii as a parasite of *Dacus* (*Bactrocera*) *cucurbitae*, Coq., in 1916, are recorded [*R. A.E.*, A, v, 2; viii, 347, etc.], and the biology of the parasite is described. The physiology and anatomy of the various stages are extensively dealt with.

COTTON (R. T.). **Tamarind Pod Borer,** *Sitophilus linearis* (**Hbst.**).—*Jl. Agric. Res., Washington, D.C.*, xx, no. 6, 15th December 1920, pp. 439–446, 1 plate.

The immature stages of *Calandra* (*Sitophilus*) *linearis*, Hbst., are described. This Curculionid is very abundant in southern Florida, and undoubtedly occurs wherever the tamarind (*Tamarindus indica*) is grown. As the food-plant grows only in tropical or sub-tropical climates, the activities of the insect are not interrupted by winter. The injury is confined to the seed pods. The adults enter the pod at the stem end, in which cracks commonly occur owing to the swaying of the pod. They then bore through the pulp into the seed, making a cylindrical cavity in which from 12 to 50 eggs are laid. This operation requires from one to two weeks, and as the eggs hatch in three days, the first larvae appear before the last egg is laid. The oviposition period lasts about 84 days, during which time about 180 eggs may be deposited. The larvae begin at once to feed and bore in the seed. The burrows radiate from the egg-cavity to all parts of the seed, but the shell is never broken through. There are four larval stages, covering from 12 to 14 days. The prepupal stage lasts one day, and pupation about seven days. The adults remain within the seed,

feeding for a few days. Oviposition begins from 7 to 10 days after emergence. In captivity adults have fed on acorns, sweet potatoes and various fruits, but normally only tamarind seeds are attacked. No parasites of this weevil have been reared. Under laboratory conditions the larvae and pupae are attacked by the predaceous mite, *Pediculoides ventricosus*, Newp., but under field conditions it is doubtful whether it would be able to penetrate to the larval burrows.

AGEE (H. P.) & SWEZEY (O. H.). **Directors' Report.**—*Proc. 39th Ann. Meeting Hawaiian Sugar Planters' Assoc., Honolulu*, 8th December 1918; 1920, pp. 142–185.

This report has already been noticed elsewhere [*R.A.E.*, A, viii, 72].

HERRICK (G. W.). **Insects of Economic Importance.**—*New York*, The Macmillan Co., 1920, 172 pp. [Price $1.75.]

This book may be regarded as an introduction to the study of economic entomology. The usual methods of control are enumerated, the insecticides and their application being dealt with in some detail. A short account is given of the more important of the insects themselves, classified under the crops they attack in order of their importance, with notes on the measures applicable in each case. A considerable amount of useful information is given in a condensed form, but in the majority of cases the species could hardly be identified from the short description given, if they were not already well known. The insects selected are those of importance in New York State, and, where they are widely distributed, it is the life-history as it occurs in that State that is described.

COLLINS (S. H.). **Chemical Fertilizers and Parasiticides.**—*London*, Baillière, Tindall & Cox, 1920, xii + 273 pp., 8 figs. [Price 10*s*. 6*d*. net.]

This book is divided into six parts, dealing with separate branches of the subject, the last of which is devoted to chemical insecticides and fungicides. Of inorganic poisons the principal insecticides considered are lead arsenate, lime-sulphur and potassium sulphide; and of organic poisons, carbon bisulphide, hydrocyanic acid, petroleum emulsions, soap, creosote, naphthaline, tobacco, pyrethrum and hellebore. In all cases almost the whole of the information given concerns sources and modes of manufacture, but is very convenient for reference from the chemical standpoint. Useful lists of other works dealing with the subject are appended.

MISRA (C. S.). **"The American Blight" or "The Woolly Aphis,"** *Eriosoma* (*Schizoneura*) *lanigera*, **Hausmann.**—*Agric. Jl. India, Calcutta*, xv, no. 6, November 1920, pp. 627–635, 5 plates. [Received 12th February 1921.]

In view of the probable extension of fruit-growing in the Himalayas, the attention of would-be growers is drawn to *Eriosoma lanigerum* and the injury done by it. This Aphid was first noticed in India in 1889, when nearly every orchard in Coonoor, South India, was said to be destroyed by it. It is now an established pest in various parts

of India, including the Himalayas; a list of localities is given. There is no doubt that it was introduced on imported apple stocks. In view of the fact that the elm is the primary host, attention is drawn to the need for examining any elms near apple orchards.

Spraying against the aerial form and grafting against the root form are the measures mentioned.

D'EMMEREZ DE CHARMOY (D.). **Report on the Work of the Division of Biology.**—*Mauritius: Ann. Rept. Dept. Agric. 1919,* 1920, pp. 12–13. [Received 14th February 1921.]

A fresh infestation of *Lachnosterna* (*Phytalus*) *smithi* was discovered, against which remedial measures are in progress. During the year 69,102,233 beetles were destroyed, the number being considerably smaller than in the previous year; the parasite, *Tiphia parallela,* is largely responsible for this. Other pests recorded are *Oryctes tarandus* on sugar-cane and a gall insect on mango.

The Mango-tree Borer (Violin) (*Batocera rubus*).—*Mauritius: Dept. Agric., Reduit,* Leaflet 10, 23rd July 1918, 2 pp., 3 figs. [Received 14th February 1921.]

The Longicorn beetle, *Batocera rubus,* known locally as the mango-tree borer, or violin on account of the peculiar sound it produces when irritated, does considerable damage to mango and other trees in Mauritius, and its partiality for kapok appears to be responsible for the discontinuance of the cultivation of that useful tree in the Colony.

Brief notes on the structure of the adults and larvae are given. The eggs are deposited singly in cracks in the bark, in which the young larvae remain for the greater part of their life. Their mines are irregular, narrow and sinuous. When they are 40–45 mm. long, they bore large circular galleries in the wood; when these finally reach the outer surface immediately under the bark, the larvae pupate. Though concealed in the trunk and branches, their presence is betrayed by the brownish fluid trickling from the wound. When they are under the bark the tree can be saved, but when they are in the wood there is no practical means of destroying them. There is ground for believing that the life of the larva is not less than one year. The adults are found all the year round, but more abundantly in summer, at which period the attacks of the larvae are first noticed.

The beetles may be captured and killed. Trees severely infested with the larvae should be felled and split into pieces and all the larvae destroyed. Logs should not be left on the ground. If a tree is slightly infested the larvae may be cut out. A trained man can in less than a day clear a tree of all its larvae.

This pest also occurs in Madagascar, Réunion and elsewhere.

Departmental Activities, November, 1920: Entomology.—*Jl. Dept. Agric., Union S. Africa, Pretoria,* ii, no. 1, January 1921, pp. 14–16.

An arrangement has been made to have codling moth larvae collected in autumn in Italy and sent to South Africa, with the view of introducing the Italian parasites of this pest. An attempt is also being made to introduce *Aphelinus mali* from North America, where it

parasitises the woolly aphis [*Eriosoma lanigerum*], and a shipment of the parasitised Aphids has reached Capetown.

During November outbreaks of locust hoppers occurred in various districts. In the Transvaal a reported outbreak was found to be due to a remarkable abundance of immature grasshoppers so closely resembling the true locust hoppers that experienced officers at first sight mistook them for the latter; no similar case has ever before come to the notice of the division.

VAN DER MERWE (C. P.). **The Tobacco Slug** (*Lema bilineata*, **Germ.**).—*Jl. Dept. Agric., Union S. Africa, Pretoria*, ii, no. 1, January 1921, pp. 28–38, 3 figs.

Until recently tobacco has been considered to be free from serious pests in the field in South Africa, probably because no plants of its genus are indigenous there. A potentially serious pest has now appeared in the form of a South American Chrysomelid beetle, *Lema bilineata*, Germ., probably introduced during the South African War, when large quantities of forage, etc., were imported from Argentina.

The first record of its presence was made in 1911 at the Cedara Agricultural School, Natal, and it was first observed by the author in Durban in 1916, feeding on *Physalis lobata*, an introduced plant and a common weed.

The lower leaves of tobacco in the field are the first to be attacked. The eggs are laid almost invariably on the under-sides of the leaves in close masses of 15–20. At first the larvae are gregarious and attack only the lower surface of the leaf; later they separate, and eat large ragged holes through the leaf. If many are present, only the midribs are left. In some places the plants, both in the seed-beds and in the fields, have been completely destroyed. Tobacco in the curing sheds, and even in bales, is also attacked, but this only occurs while it is still green.

Where it is customary to cut the whole plant and hang it up in the shed, drying takes more than a month, and larvae brought in on the plant have time to mature. The damage done in the sheds is therefore very great; it can be prevented by other methods of drying, but should be trifling if proper remedies are applied in the field.

Observations indicate that the latest date for oviposition is about the end of March. At Durban the period during which the beetles did not feed was found to be about four months. Eggs were found again from 4th September, and beetles were observed to be feeding two days before. The egg-stage lasts four to seven days at Durban, or even less at midsummer. The greatest number of eggs obtained from one female was 2,421, with an average of 1,225. The egg-laying period lasted from 15 to 124 days, with an average of 65, exclusive of the period of hibernation. The larva moults three times, the last moult being when it is six to ten days old. It pupates two to four days later. From 10 to 19 days elapse between entrance into the ground for pupation and emergence of the adult, the full cycle from the egg to the adult varying from 17 to 30 days. As a rule the adults are comparatively long-lived, hibernated females surviving from 194 to 284 days, with an average of 230. Though no males have been kept alive through the winter, it is believed that some hibernate. Paired females may hibernate, and without again mating, lay fertile eggs, being thus able to set up new centres of infestation.

Hibernating individuals have been found under stones, in sheds amongst loose and baled tobacco, and in cupboards and other warm places.

At Durban the maximum number of generations appears to be eight, but the average from an overwintered female will be smaller, owing to the extended egg-laying period, it being possible for a female to be still ovipositing long after her first progeny has become adult.

The observed food-plants of *L. bilineata* are tobacco, *Nicandra physaloides* (wild Cape gooseberry), *Physalis peruviana* (Cape gooseberry) and other species of *Physalis*, *Datura stramonium* and *D. tatula*, whilst *Salpichroa rhomboidea* is recorded in Argentina. All these are Solanaceous plants, and none are known to be natives of South Africa. Not all Solanaceae can serve as food; tomato, capsicum, *Solanum melongena*, and *Cestrum aculeata* (inkberry) were found unsuitable. A few other plants, such as sweet potato and lucerne, were also refused. Potatoes are attacked, though only slightly compared with *Datura stramonium* in potato fields.

It is not possible to say whether the range of *L. bilineata* has been extended in South Africa by natural spread or by traffic. The greatest danger would appear to be in the bales of tobacco. According to some reports wet weather greatly favours this pest, and there is some hope that it will not thrive in the drier parts of the country. As *L. bilineata* belongs to a genus well represented in South Africa, it is likely that native parasites will adapt themselves to it in increasing numbers. The most effective enemy observed is the ant, *Pheidole punctulata*, and at Durban no infestation by larvae has been found on the dry friable soils preferred by this ant. *Myrmecaria eumenoides* also carries off the larvae. *Plagiolepis custodiens* is apparently useless. Various Reduviid bugs have been seen attacking both beetles and larvae. Other enemies included spiders and poultry.

Though only a few experiments have been carried out, it is thought that this pest can be kept down successfully. The crop at the Piet Retief Experiment Station was kept entirely free in 1920 by hand-crushing, an expensive but effective method. It is probable that spraying with a stomach-poison, such as lead arsenate, will become more and more popular. Sodium arsenite from the cattle-dipping tanks has been tried, and usually one trial was enough to prevent another, but as good results have been obtained with weak dilutions of this poison it is necessary to utter a warning against its use. The dry application of arsenate of lead powder may prove effective on tobacco, the leaves of which are sticky and hold the dust well. A simple apparatus for this purpose is described. The air should be still and the plants moist with dew or rain. Dusting with fine sifted lime or fine dry earth experimentally reduced the number of larvae, but whether the results would be satisfactory in the field remains to be seen. The tops of young tobacco plants may be dipped in a lead arsenate spray solution prior to planting out, which provides a protection that enables the plants to get a good start.

Beeson (C. F. C.). **The Food Plants of Indian Forest Insects, Part V.** —*Ind. Forester, Allahabad,* xlvii, no. 1, January 1921, pp. 21–25.

This continuation of lists previously noticed [*R.A.E.*, A, vii, 534] deals with the Scolytids:—*Crossotarsus bonvouloiri*, Chap., in *Shorea robusta*; *C. coniferae*, Steb., in *Cedrus deodora* and *Picea morinda*; *C. fairmairei*, Chap., in *Pinus excelsa*; *C. minax*, Wlk., in *Terminalia*

belerica; *C. saundersi*, Chap., in *Cassia fistula, Heritiera fomes, Shorea robusta* and *Terminalia tomentosa*; *C. squamulatus*, Chap., in *Heritiera fomes* and *Tectona grandis* [previously erroneously recorded as in *Shorea robusta, R. A. E.*, A, vi, 522]; *Diapus aculeatus*, Blandf., in *Quercus incana* and *Q. semecarpifolia*; *D. capillatus*, Samps., in *Quercus lamellosa*; *D. furtivus*, Samps., in *Shorea robusta* and *S. talura*; *D. impressus*, Jans., in *Alnus nepalensis, Quercus incana* and other trees; *D. quadrispinatus*, Chap., in *Alnus nepalensis*; *D. quinquespinatus*, Chap., in *Shorea robusta*; *Platypus biformis*, Chap., in *Pinus longifolia*; *P. cupulatus*, Chap., in *Terminalia belerica*; *P. cupulifer*, Wichm., in *Shorea robusta*; *P. curtus*, Chap., in *Shorea robusta*; *P. falcatus*, Strohm., in *Alnus nepalensis*; *P. indicus*, Strohm., in *Artocarpus integrifolia*; *P. rectangulus*, Samps., in *Anogeissus latifolia*; *P. secretus*, Samps., in *Aesculus punduana* and *Odina wodier*; *P. solidus*, Chap., in *Albizzia lebbek, Butea frondosa, Dalbergia sissoo, Mangifera indica, Tectona grandis* and other trees; *P. suffodiens*, Samps., in *Pithecolobium saman* and other trees; and *P. uncinatus*, Blandf., in *Heritiera fomes, Shorea robusta, Terminalia tomentosa* and other trees.

Smith (H. S.). **Report of the Pest Control Service, 1919-20.**—*Mthly. Bull. Cal. Dept. Agric., Sacramento*, ix, no. 10–11, October–November 1920, pp. 417–421, 3 figs. [Received 10th February 1921.]

It is estimated that about £1,200,000 were spent in California in 1918 for the control of insect pests. The problem of the control of *Pseudococcus* sp. has been solved by the propagation and distribution on a large scale of its natural enemies. *Saissetia oleae*, Bern. (black scale) is being gradually reduced by similar means. This scale has been causing a loss to the citrus industry of about £400,000 annually. Vacuum fumigation has proved of great value in controlling pests of dried dates and other food products. The application of liquid insecticides under vacuum is being developed, and shows great promise. The walnut packing houses in southern California are now all equipped with apparatus for the sterilisation of sacks, and the law enacted for the purpose of preventing the spread of codling moth [*Cydia pomonella*] in walnuts has been effectively enforced. A new prepared bait for grasshoppers will probably prove to be a great convenience. A serious outbreak of *Crioceris asparagi* (asparagus beetle) occurred, but was checked.

Problems in control that still require solution are presented by *Dialeurodes citri*, R. & H. (citrus whitefly), *Otiorrhynchus rugifrons* (strawberry root weevil) and the Mediterranean fig scale [*Lepidosaphes ficus*]. The possibility of biological control of *Chrysomphalus aurantii*, Mask. (red scale) and *Lepidosaphes beckii*, Newm., requires to be studied.

Mackie (D. B.). **Report of Field Entomologist (Los Angeles), 1919-20.**—*Mthly. Bull. Cal. Dept. Agric., Sacramento*, ix, no. 10–11, October–November 1920, pp. 429–435, 1 fig. [Received 10th February 1921.]

As explained in the preceding paper, the control of the codling moth [*Cydia pomonella*] in walnuts has largely been effected by compulsory sterilisation of the sacks, some 983,562 having been treated under the supervision of the field entomologist.

A system of fumigation under vacuum is described and illustrated. By this method dates in any form can be freed from infestation by one hour's treatment, and it is considered inevitable that this system will ultimately be adopted for many kinds of food products. At present lack of equipment has limited experiments to only a few of the possibilities, but insects that have been successfully treated include *Phthorimaea operculella*, Z. (potato-tuber moth) in potatoes, insects infesting dehydrated vegetables (which will in future be treated by this method as a regular trade practice), and *Merodon equestris* (narcissus fly) in bulbs, etc. These promising results have led to further investigation of this method in the use of liquid insecticides. An application was made with date offshoots for the control of *Phoenicococcus marlatti*; these were submerged in the insecticide and the air exhausted; all air pockets are expanded, and the air rises to the surface in bubbles. As the desired vacuum is obtained, the pressure is released and the insecticide penetrates into all interstices of the plant. The time required is fifteen minutes, and growers report complete destruction of the scale and no injury to the offshoots. The exact procedure for certain Diaspine scales on nursery stock has yet to be worked out.

For the destruction of *Pseudococcus gahani* (citrophilus mealybug) in empty fruit-boxes a box steriliser has been devised which is automatic in action and is attached to the box dump with which it works, passing the boxes through a hot chamber at a temperature of 200° F.; this kills all forms of the scale. Steam has been used as the killing agent, but it is hoped to develop a steriliser using hot air, in which the entire apparatus will be complete in itself, with its own heating unit. The difficulty of applying prompt remedies for grasshopper invasions has always been that poison bait has had to be freshly prepared to be effective; a formula has now been devised that can be prepared beforehand and preserved in cans for use when needed.

URBAHNS (T. D.). **Report of Field Entomologist (Sacramento) 1919-20.** —*Mthly. Bull. Cal. Dept. Agric., Sacramento*, ix, no. 10–11, October–November 1920, pp. 435–439, 2 figs. [Received 10th February 1921.]

The introduction of parasites into California has chiefly been effectual from South Africa, with the object of reducing the black scale [*Saissetia oleae*, Bern.]. The distribution of Coccinellids has continued on a large scale, and there is urgent demand for *Hippodamia convergens* to check the development of Aphids.

Field control of insects has included efforts to prevent the recurrence of the enormous loss occasioned annually by pears infested with codling moth [*Cydia pomonella*]. Promising results were obtained from thorough spraying, but there are still certain defects in this system to be studied. Against grasshoppers, at least 350 tons of poisoned bait have been distributed annually for the past two seasons. *Tortrix* (*Archips*) *argyrospila* and *T.* (*A.*) *rosaceana* (leaf-rollers) have caused great injury to prune and pear trees. Arsenical sprays were of considerable value, but the project must be carried through the winter for a comparison of winter sprays against the eggs of these moths. Remedial measures against *Crioceris asparagi*, L. (asparagus beetle) have shown promise, but require further study; the results of spraying for *Taeniothrips inconsequens* (*pyri*) (pear thrips) proved

disappointing, partly, perhaps, owing to unfavourable weather conditions; more thorough and effective spraying methods are necessary. Red spider [*Tetranychus*] has been one of the most destructive pests of the season; and an educational campaign against it is advised. *Pseudococcus maritimus* (pear mealybug) is becoming increasingly abundant, and more attention should be given to remedial measures for it. *Typophorus canellus* (strawberry leaf beetle) is a dangerous pest, and its control requires careful consideration.

Armitage (H. M.). **Report of the Biological Control Work directed against the Mealybugs, 1919-20.**—*Mthly. Bull. Cal. Dept. Agric., Sacramento,* ix, no. 10–11, October–November 1920, pp. 441–451, 7 figs. [Received 10th February 1921.]

Much progress has been made in the biological control of the mealybugs infesting *Citrus* in southern California. To place this work on a sound economic basis it will, however, be necessary to find a cheaper food-plant than potato sprouts on which to rear the mealybugs for maintaining a supply of parasites. The species against which the parasites are used are *Pseudococcus gahani, P. citri, P. maritimus* and *P. krauhniae.* Particulars of the production of parasites in the laboratory during the past three fiscal years, as well as for July and August of 1920, are given, the species reared or collected including *Cryptolaemus montrouzieri, Tanaomastix abnormis, Leucopis bella, Sympherobius* sp., *Rhizobius ventralis, R. lophantae, Hyperaspis lateralis, Novius cardinalis, Pauridia peregrina, Orcus chalybaeus* and *Delphastus* sp.

A few of the outstanding results of the year's field work include the commercial control of *P. citri* in Ventura county; the establishment of the internal parasites, *T. abnormis,* Gir., and *P. peregrina,* Timb., on *Pseudococcus krauhniae* (Japanese mealybug); the commercial control of *P. gahani* in one locality by *C. montrouzieri*; and the complete clearing of *P. maritimus* by the same predator in another locality and of *P. citri* in a part of Orange county. *Sympherobius barberi* (brown lacewing), liberated from laboratory-grown material, has been a prominent factor in reducing the numbers of *P. krauhniae,* and *T. abnormis* was established on several new infestations of its host, *P. citri.* Considerable numbers of mealybugs have also been destroyed by the native predators, *Chrysopa* sp. (green lacewings), the Dipteron, *Leucopis bella* (which clears up egg-masses of *P. gahani*), and the brown-lacewings, *S. barberi* and *S. californicus.* Regarding the relation of ants to the biological control of mealybugs, the author considers that they are a considerable hindrance, and as a rule ant control is demanded of the grower before he is supplied with natural enemies. Further increase in production is necessary if the demands upon the laboratory are to be met. The working of the various insectaries is described.

Compere (H.). **Report on the Biological Control Work directed against the Black Scale, 1919-20.**—*Mthly. Bull. Cal. Dept. Agric., Sacramento,* ix, no. 10–11, October–November 1920, pp. 451–458, 2 figs. [Received 10th February 1921.]

This report includes a discussion of the fundamental principles governing natural control of black scale [*Saissetia oleae*], and an account of the laboratory work and insectary production. The parasite

Aphycus lounsburyi, introduced from South Africa and Australia, has been successfully established in California, and it is hoped to colonise it this year in all districts where scale conditions are favourable. It is necessary, however, to make some provision for maintaining it throughout all periods ; in the interior districts particularly it is reduced to insignificant numbers by the continually recurring periods when the scale is not present in a suitable form for food. At these periods it is necessary to supplement its numbers by insectary work or by finding an auxiliary food-supply. In the latter connection it is remarked that at the time when *A. lounsburyi* is dying out for lack of food there is an abundant supply of suitable-sized scales on pepper trees and a few ornamental shrubs. If in the summer months a supply of the parasite could be taken from the citrus orchards and placed on the pepper trees, they could thus be maintained, and re-transferred to *Citrus* when the scales were large enough on them. Satisfactory natural control is only maintained by destroying practically all the scales of each generation.

Other beneficial insects used in this work are a Hymenopteron, *Scutellista cyanea,* of which the larvae are predaceous on the eggs of *S. oleae,* and *Rhizobius ventralis,* a Coccinellid introduced from Australia.

The working of the chief insectaries is briefly described.

Maskew (F.). **Report of the Plant Quarantine Service, 1919-20.**—*Mthly. Bull. Cal. Dept. Agric., Sacramento,* ix, no. 10–11, October–November 1920, pp. 459–467, 3 figs. [Received 10th February 1921.]

The work of the Plant Quarantine Service of the Department of Agriculture during the year ended 30th June 1920 is reviewed, and reports from the various stations are included.

Nougaret (R. L.). **Report of the Viticultural Service, 1919-20.**—*Mthly. Bull. Cal. Dept. Agric., Sacramento,* ix, no. 10–11, October-November 1920, pp. 487–501, 5 figs. [Received 10th February 1921.]

Only those insect pests of the vine that are a serious menace to Californian vineyards, and that cause damage for which no practical control is known, are here mentioned. *Phylloxera* was introduced into California about 1858, and made much slower progress than in France, some vineyards being infested for as long as twenty years before their cultivation became unprofitable. Very little has yet been done to guard against the pest. The progress of infestation varies largely in accordance with climatic conditions, and a deficient rainfall during the past two or three seasons has been the cause of further weakening of the vitality and resistance of the vines.

If California is to maintain her grape industry, it is clear that resistant stocks only must be planted on soils susceptible to *Phylloxera,* and it is always these soils that are the best for vine-growing. A survey has been made of the chief vine-growing counties, which demonstrates the susceptibility and immunity of certain kinds of soils and shows the infested localities. Experiments have been carried out over a number of years to test resistant varieties and their adapability to Californian soils. Both propagators and purchasers of rooted vines

for planting have been greatly inconvenienced by the enactment of strict regulations regarding the introduction of rooted vines; it is suggested that a certificate attesting their disinfection, irrespective of where grown, should be considered sufficient guarantee.

The grape mealybug, *Pseudococcus maritimus*, is less destructive to vines, but its presence in the bunches of grapes renders the fruit unmarketable. Every effort should be made to find a means of eradicating it.

The Sphingid, *Pholus achemon*, occurred in alarming numbers in 1919, but prompt measures checked the infestation; in 1920 nothing was done to control a fresh outbreak, with the result that three generations occurred, young larvae appearing about 25th May, 6th July and 20th September, and heavy losses were sustained.

MacGillivray (A. D.). **The Coccidae.**—*Urbana, Ill.*, The Scarab Co., 1921, 502 pp. [Price $6.]

This volume gives a very short introduction to the systematic position, life-history, external anatomy, and methods of preparation for study, of the Coccidae. The main part of the volume is devoted to the identification of the sub-families, genera and species by means of dichotomous tables, each sub-family being prefaced by a general account. The sub-family tables dealing with the identification of the first nymphal and adult stages will be found useful by students. In his treatment of the genera the author has erected over 120 new ones, and those that previous authors considered to be sub-genera have been raised to generic rank. Time will show whether the classification proposed here will stand, but it seems as if the author, in his endeavour to assist his students, for whom these tables were originally compiled, had carried what we believe to be an artificial arrangement to its logical conclusion, and in the process has lost sight of the natural affinities of the insects. It is not quite so easy to assign species to their genera as the author's tables would lead one to suppose. The extent of the proposed alterations may be judged from the fact that in the Lepidosaphini there are 17 new genera erected, in the Diaspidini 44, and in the Aspidiotini 53. The value of the work is lessened by the fact that the author has had to rely very largely upon descriptions; all genera previously founded have apparently been accepted, even although subsequent authors have shown them to be erroneous. A glance at the bibliography suggests that the author has not had access to all the literature. The tables dealing with the species will probably be found useful, inasmuch as they gather into one volume descriptions that have hitherto been widely scattered. In a work of such size it is perhaps expecting too much to have no printer's errors, but many of the genera might have been revised with advantage.

van den Broek (M.) & Schenk (P. J.). **Vijanden van Tuinbouwgewassen.** [Pests of Horticultural Plants.]—*Groningen*, J. B. Wolters, 108 pp., 27 figs. Price fl. 1.25.

This practical little book is intended for use in the winter horticultural instruction courses in Holland. Both animal and fungous pests are dealt with, and these are arranged according to the plants they infest. In each case the scientific name is given, and there are short notes on the injury. A brief section deals with the various insecticides in general use.

FERDINANDSEN (C.) & ROSTRUP (S.). **Oversigt over Sygdomme hos Landbrugets og Havebrugets Kulturplanter i 1918.** [Report on Insect Pests and Fungous Diseases of the Field and Orchard in 1918].—*Tidskrift for Planteavl, Copenhagen*, xxvi, 1919, pp. 683–733.

Among the cereal pests *Oscinella frit* did, as usual, great damage to oats, especially because the spring corn was sown rather late on account of cold and dry weather; this also caused a great attack of *Chlorops taeniopus* on barley. Attacks of *Mayetiola* (*Cecidomyia*) *destructor*, *Zabrus gibbus* on rye, *Jassus sexnotatus* on oats and spring rye, *Phyllotreta vittula* on barley and oats, *Tortrix paleana* on oats, *Contarinia* (*Cecidomyia*) *tritici* on wheat, and *Hadena secalis* and *H. basilinea* on rye and wheat, were also recorded, but were of less importance.

The Aphids, *Macrosiphum granarium* (*Siphonophora cerealis*) and *Siphonaphis padi* (*Aphis avenae*), particularly the latter, did considerable damage to oats and barley; rye and wheat were also attacked by them. The infestation appeared in June and July as a continuation of the frit-fly attack, and owing to the dry weather the crops suffered severely. Thrips—*Limothrips denticornis* on rye and barley and *Haplothrips* (*Anthothrips*) *aculeatus* on barley—were numerous, but did not do much damage. The mite, *Tarsonemus spirifex*, was numerous on oats.

Calandra granaria and *Anobium paniceum* did some damage in stored grain.

Sitona lineata did some damage to peas, on which an Aphid, a thrips *Kakothrips pisivora* (*Physopus robustus*), larvae of *Cydia* (*Grapholitha*) and Cecidomyiid larvae were also observed.

Pests of cabbages, rape, turnips and beets included:—*Silpha opaca*, *Cassida nebulosa*, and especially *Pegomyia hyoscyami* and *Aphis rumicis* (*papaveris*) attacking beets. *Phorbia* (*Chortophila*) *brassicae*, *Meligethes aeneus* and flea-beetles did very serious damage to cabbages and rape, while *Ceuthorrhynchus quadridens*, *C. assimilis*, *C. sulcicollis*, *Eurydema oleracea*, *Pieris brassicae*, *P. rapae*, *Barathra* (*Mamestra*) *brassicae* and *Perrisia* (*Cecidomyia*) *brassicae* were minor pests of these crops.

Carrots were attacked by *Trioza viridula*, *Siphocoryne capreae*, *Biston zonarius*, which in one locality occurred in immense numbers, and especially *Psila rosae*. Celery was frequently infested with the mines of *Acidia cognata*, and potatoes in some places were severely attacked by *Calocoris bipunctatus*; *Hydroecia micans* was also recorded from potatoes.

On lucerne and clover attacks were recorded of *Sitona lineata*, *Hypera* (*Phytonomus*) *nigrirostris*, *H.* (*P.*) *variabilis* and *Apion apricans*.

Larvae of *Hadena strigilis* did some damage to cock's-foot grass cultivated for seed. *Cleigastra flavipes* also attacked grasses.

Apple and pear pests included:—*Cheimatobia brumata* and *C. boreata*, *Olethreutes variegana*, *Eucosma ocellana*, *Notolophus* (*Orgyia*) *antiquus* and especially *Anthonomus pomorum* and *Malacosoma* (*Gastropacha*) *neustria*.

Larvae of *Cydia pomonella* (*Carpocapsa pomonana*) were frequently met with in apples, but very rarely in pears; those of *Hyponomeuta* were common on *Crataegus* but scarce on apple and pear trees. *Phyllobius oblongus*, *Lyonetia clerkella*, *Thomasia* (*Diplosis*) *oculiperda*,

thrips, the bugs *Lygus*, *Calocoris* and *Atractodes mali*, and the Aphids *Aphis pomi* (*mali*), *A. crataegi* and *Siphonaphis* (*Siphonophora*) *padi*, were met with on fruit trees. *Psylla mali* and *Paratetranychus pilosus* were controlled by the use of tobacco extract containing 0·1 per cent. nicotine and 1 per cent. soap.

Pests of stone-fruits included *Cheimatobia brumata* on cherries and plums, *Diloba coeruleocephala* on cherries and apricots, *Hyponomeuta* spp. on mirabel, bird cherries, blackthorn, spindle tree and lilac, and *Hoplocampa fulvicornis* and *Tortrix funebrana* doing great damage to plums and mirabel. The Aphids, *Hyalopterus arundinis* (*pruni*), *Aphis cerasi* and others, did some damage, but spraying with formalin in the evenings was effective against them.

Raspberry pests included *Aegeria* (*Sesia*) *bembeciformis*, *Byturus tomentosus*, *Anthonomus rubi* and *Otiorrhynchus ligustici*, the latter in one locality doing very great damage by destroying the young shoots.

Pests of gooseberries, currants and black currants included *Pteronus* (*Nematus*) *ribesii* and *Pristiphora pallipes* (*appendiculata*), which did great damage in June and July, but against which spraying with Paris green was effective, *Abraxas grossulariata*, *Cheimatobia brumata*, *C. boreata*, *Lygus* and *Calocoris* spp., *Lecanium* sp., *Bryobia ribis*, *Tetranychus* sp. and *Eriophyes ribis*. Aphids on black currants were destroyed by spraying in the evening with 0·25 per cent. formalin. On hazel, *Balaninus nucum* and *Eriophyes avellanae* occurred. On strawberries, *Anthonomus rubi* did great damage. *Blennocampa geniculata*, *Oxygrapha* (*Acalla*) *comariana*, *Hydroecia micacea* and *Tarsonemus fragariae* were also recorded. Beans and cucumbers were attacked by *Lygus*, *Calocoris*, thrips, *Smynthurus*, *Tetranychus altheae* and *Oniscus*, and melons by Aphids and *Tetranychus*. On asparagus *Crioceris asparagi* was common, *Acrolepia assectella* on leeks and *Hylemyia antiqua* on onions and leeks. Mines of *Phytomyza affinis* caused very great damage to the foliage of cultivated *Chrysanthemum*.

As usual, widespread damage was caused by *Euxoa* (*Agrotis*) *segetum* and other cutworms, *Agriotes lineatus*, *Tipula paludosa*, *Forficula auricularia*, *Blaniulus guttulatus* and others on various plants. *Melolontha melolontha* (*vulgaris*) and *Phyllopertha horticola* also did some damage.

Fritfluer i Vintersaed. [Frit-flies in Winter Crops.]—*Vort Landbrug, Copenhagen*, 1919, p. 136; also *Ugeskrift for Landmaend*, xliv, 1919, p. 185.

An attack of *Oscinella frit* on wheat and rye is recorded, after grass had been lately ploughed in, from which it would appear that the frit-fly larvae can leave the grass ploughed under and migrate to young corn.

Rostrup (S.). **Krusesyge i Kaalroer.** [Curly-leaf Disease in Rape.] —*Ugeskrift for Landmaend, Copenhagen*, lxiv, 1919, pp. 563–564.

In 1912 curly-leaf disease in rape and turnip was shown by Taylor to be due to the midge, *Contarinia nasturtii*, in England, and the same species is now found to be the cause of this disease in Denmark.

Gram (E.). **Rönnebaermöllet.** [*Argyresthia conjugella.*]—*Gartner-Tidende, Copenhagen,* xxxv, 1919, pp. 303–305.

A serious outbreak of *Argyresthia conjugella* on apples in Denmark is recorded in 1919. Considerable damage was also done to the service tree, the favourite food-plant of this moth.

Jensen-Haarup (A. C.). **Cikader (Homoptera).**—*Danmarks Fauna Nr., 24, Copenhagen,* 1920, 190 pp., 79 figs.

This is a systematic survey of the Homoptera of Denmark. It deals with 226 species, and is furnished with many instructive illustrations.

Michelini (G.). **La Fillossera della Vite.** [The Vine *Phylloxera.*]—*Consigliere dell'Agric., Turin,* ix, no. 1, January 1921, pp. 8–16, 7 figs.

A popular account is given of the various forms of *Phylloxera vastatrix,* the damage it does, and the measures adopted against it.

Stahel (G.). **Een wild Cacaobosch aan de Mamaboen-kreek (Boven-Coppename).** [A wild Cacao Wood on the Mamaboen Creek, Upper Copename.]—Reprint from *De Indische Mercuur* [*sine loco*], 24th September 1920, 12 pp., 9 figs. [Received 12th February 1921.]

The discovery in April 1920 of an area of wild cacao is recorded in Dutch Guiana. Even if Indians had introduced the plant, this must have taken place a very long time ago; otherwise the occurrence of such extensive areas covered with old trees cannot be accounted for.

According to Mr. A. Reyne no traces were found of the pest resembling *Helopeltis* [*Monalonion*] occurring in Brazil, of the cacao beetle, *Steirastoma depressum,* or of the cacao thrips [*Heliothrips rubrocinctus*]. The absence of the thrips is remarkable, as it has been found in the neighbourhood on *Psidium polycarpon.* The only injury noticed was of an occasional character and due to leaf-eating beetles and caterpillars.

Krahe (J. A.). **Lehrbuch der rationellen Korbweidenkultur.** [Text-book of rational Basket-Willow Cultivation.]—*Limburg a. L.,* Verlag Gebr. Steffen, 6th edn., price 7 marks. (Notice in *Zeitschr. Pflanzenkr., Stuttgart,* xxx, no. 8, 1920, p. 284.)

In the section on insect pests of willow it is stated that ants are injurious owing to the construction of nests and the fact that they foster Aphids. *Bostrychus* is only a secondary pest. The larvae of various Lamellicorn beetles attack the roots and cause much harm. Leaf-beetles of the genera *Phyllodecta* (*Phratora*) and *Melasoma* (*Lina*) do very considerable injury. Lepidopterous pests are represented by *Stilpnotia salicis,* L., and *Earias chlorana,* L. *Tipula pratensis,* L., is sometimes harmful.

van Emelen (A.). **Combate aos Piolhos das Abelhas.** [Measures against *Braula coeca.*]—*Chacaras e Quintaes, S. Paulo,* xxiii, no. 1, 15th January 1921, p. 55, 1 fig.

If *Braula coeca* is present in large numbers in a bee-hive the best method of driving it away consists in placing a lump of naphthaline at each of the four corners. This will have the desired effect in one or two weeks, without injuring the bees. Naphthaline in the form of powder must not be used, as the bees are then able to remove it. Camphor is said to possess the same repellent property, but in a more marked degree.

Pictet (—). **Observations biologiques sur** *Psilura monacha.*—*Mitt. Schweiz. Ent. Ges., Berne,* xiii, no. 2, December 1920, pp. 63–64. [Received 16th February 1921.]

In 1920 the oviposition of *Liparis* (*Psilura*) *monacha* (nun moth) occurred in June. The eggs aestivate and then hibernate. In the open they hatch in March at a minimum temperature of 8° C. (46° F.). The caterpillars are polyphagous, and in captivity may be fed on most conifers and many deciduous trees and shrubs. Those fed on oak develop quicker than those on larch, the respective times being 35 and 41 days.

Schneider-Orelli (O.). **Beiträge zur Biologie des pilzzüchtenden Käfers,** *Hylecoetus dermestoides.* [Contributions to the Biology of the Fungus-tending Beetle, *H. dermestoides.*]—*Mitt. Schweiz. Ent. Ges., Berne,* xiii, no. 2, December 1920, pp. 64–67. [Received 16th February 1921.]

In Switzerland the Lymexylonidae are represented by two species, *Hylecoetus dermestoides,* L., and *Lymexylon navale,* L. The larvae of the former bore in the sapwood of beech stumps, and are occasionally found in the standing trees ; *L. navale* prefers oak.

Recent researches have shown that the forked caudal appendage of the larva of *H. dermestoides* is a tool for removing the debris in the gallery, the sides of which are covered with a fungus on which the larva feeds. The larva was formerly believed to feed exclusively on the bored wood or on bark-beetles in the mine.

The author has been able to study the symbiosis between the larva and the fungus during the hibernation period, having received in November a piece of beech trunk containing about 20 larvae. No living fungus cells were found in the larvae during the winter, but the intestines of two individuals contained fragments of wood and of shrivelled fungus. A microscopical examination of the mines revealed only a few isolated cells along the sides until the portions near the inner ends were reached ; these were coated with a layer of wood debris and fungus mycelium. The round *Ambrosia* cells are similar to those from the mines of *Xyleborus xylographus* (*saxeseni*), but measure 0·03 mm., or twice as much, across. The material maintains the fungus during the winter, and as the mines were otherwise free from wood debris, the layer would appear to be prepared by the larvae.

Godet (C.). **Rapport sur l'Activité de la Station d'Essais viticoles à Auvernier. Exercice 1918–1919.**—*Ann. Agric. Suisse, Lucerne*, xxi, no. 2, 1920, pp. 25–112, 6 figs., 4 graphs.

The chief vine pest of Neuchâtel, *Clysia ambiguella*, was rather less destructive than in preceding years. It is noticeable that in vineyards where two applications of Bordeaux mixture and nicotine were given against the eggs, the number of larvae was appreciably smaller. Numerous experiments were made with light-traps against the moths, and have led to the conclusion that these have not only not been efficacious, but are a considerable expense. While in some localities they gave apparently favourable results, it is impossible to say whether the success was due to them or to natural conditions. Light-traps placed at 20 yards distance from each other captured more moths than those at 30 yards intervals. For the first generation the height of the traps from the ground seemed to be immaterial; for the second generation a height of 24 inches from the ground was the most successful, especially for the traps placed 30 yards apart. The time and duration of flight of the moths apparently depend entirely upon temperature; it seems probable that an average day temperature of 59° F. is necessary for the emergence of moths, but meteorological conditions do not appear to be the only factors in the great variations observed during their principal flight.

Leefmans (S.). **Het Cheveluremotje** (*Musotima suffusalis*, **Hamps.**). [The Maidenhair Moth, *M. suffusalis*.]—*Teysmannia, Batavia*, xxxi, no. 9, 1920, pp. 428–431, 1 plate.

The caterpillars of *Musotima suffusalis*, Hamps., infesting maidenhair (*Adiantum*), are not easy to detect, as they are only $^2/_5$ in. long, green to the naked eye, and usually located on the underside of the leaves.

In breeding experiments larval stages of 14 and 19 days were obtained. Before pupating the caterpillar binds the leaves with webs, the cocoon hanging within them. The pupal stage lasted 7 days in most cases observed. The eggs are laid on the underside of the leaves, the egg stage lasting five to six days and the total life-cycle requiring 25–31 days. Under favourable conditions 12 or more generations a year may occur in the Dutch East Indies.

Infestation in general is more marked during the wet season, but in the dry season the infestation of maidenhair growing in verandas is greater. This is probably due to unfavourable conditions in the open causing the well-watered house-plants to become increasingly attractive.

d'Angremond (A.). **Onderzoekingen over het Dooden van** *Lasioderma serricorne*, **Fabr., in Tabak, door Middel van 1° Verhitting, 2° Benzine.** [Investigations on the Destruction of *L. serricorne* in Tobacco by means of Heat or Benzine.]—*Meded. Proefst. Vorstenlandsche Tabak, Klaten* xxxvi, 1919, 28 pp. (With a Summary in English). [Received 18th February 1921.]

When a shortage of carbon bisulphide in the Dutch East Indies was threatened in 1918 owing to shipping difficulties, attempts were made to destroy *Lasioderma serricorne*, F., in stored tobacco, by exposure to heat and by fumigation with benzine. Both these methods gave good results.

A temperature of 50° C. (122° F.) kills the larvae in three hours and the eggs in five. In practice it is possible to kill *L. serricorne*, even in the centre of a bale, by heating the latter in a fermentation room to a temperature of 55°–60° C. (131°–140° F.). The tobacco is not injured. This method is practicable on all estates that have a fermenting room.

It was found that a dose of 1½ litre benzine per cubic metre (about 2 pints per cubic yard), allowed to act over a consecutive period of 96 hours, is sufficient to kill all stages of *L. serricorne*, even at the centre of a bale. In normal times, however, disinfection with benzine will be more expensive than with carbon bisulphide.

WEISS (H. B.). **Notes on the Life-history of** *Pachypsylla celtidis-gemma*, **Riley.**—*Canad. Ent., London, Ont.*, liii, no. 1, January 1921, pp. 19–21.

The nymphs of *Pachypsylla celtidis-gemma*, Riley, a species locally common in New Jersey, form galls on the twigs of hackberry (*Celtis occidentalis*). The galls are always formed on the new wood, and in severe infestations almost every bud is deformed. *P. celtidis-gemma* hibernates in the last nymphal stage, these nymphs emerging from the galls late in May and early in June. They crawl on to the tops of the galls and to the twigs, and give rise to the adults shortly afterwards. The eggs are deposited on the lower leaf-surface close to a vein. First-stage nymphs were not found on the buds until July. Brief descriptions of the development of the nymphs and of the egg are given.

LOCHHEAD (W.). **The Natural Control of Insects.**—*12th Ann. Rept. Quebec Soc. Prot. Plants Insects & Fung. Dis., 1919–20, Quebec*, 1920, pp. 10–21, 5 figs. [Received 21st February 1921.]

The importance of the natural control of insect pests, including climate, food supply, predatory enemies and parasites, and the necessity for further knowledge of these conditions, is emphasised.

CHAPAIS (J. C.). **A Brief Study of a few Cecidomyiidae.**—*12th Ann. Rept. Quebec Soc. Prot. Plants Insects & Fung. Dis., 1919–20, Quebec*, 1920, pp. 28–31, 1 fig. [Received 21st February 1921.]

The information here given on the Cecidomyiids, *Mayetiola destructor*, Say, *Perrisia* (*Dasyneura*) *leguminicola*, Lintn. (clover flower midge), *Neocerata* (*D.*) *rhodophaga*, Coq. (rose midge) and *Contarinia virginiana* producing galls on choke cherry (*Cerasus virginiana*), has been collated from various sources.

LOCHHEAD (W.). **The European Corn Borer.**—*12th Ann. Rept. Quebec Soc. Prot. Plants Insects & Fung. Dis., 1919–20, Quebec*, 1920, pp. 36–43, 2 plates, 1 fig. [Received 21st February 1921.]

The proceedings of conferences on the European corn borer [*Pyrausta nubilalis*, Hb.] are reviewed; the bulk of the information has already been noticed [*R.A.E., A.*, viii, 97, etc.]

LEOPOLD (—). **Economy in Spraying.**—*12th Ann. Rept. Quebec Soc. Prot. Plants Insects & Fung. Dis., 1919–20, Quebec,* 1920, pp. 48–50. [Received 21st February 1921.]

The points requiring attention prior to spraying, to ensure the best results, are emphasised. For potatoes a spray of calcium arsenate, with the addition of 5 lb. of hydrated lime to 40 gals. of water, is advocated in preference to Paris green.

LOCHHEAD (W.). **An Important Bioclimatic Law.**—*12th Ann. Rept. Quebec Soc. Prot. Plants Insects & Fung. Dis., 1919–20, Quebec,* 1920, pp. 50–53, 3 charts. [Received 21st February 1921.]

The advisability of collecting records for Quebec and for the application of the above law in this Province is urged [*cf. R. A. E.*, A, ix, 126].

WEISS (H. B.). **A Bibliography on Fungous Insects and their Hosts.**—*Ent. News, Philadelphia,* xxxii, no. 2, February 1921, pp. 45–47.

A list of references is given to American literature dealing with the fungi inhabited by insects, including some references relating to insects indirectly associated with fungi.

HEINRICH (C.). U. S. Bur. Ent. **New Synonymy in a recent Paper on the European Corn Borer (Lepid.).**—*Ent. News, Philadelphia,* xxxii, no. 2, February 1921, pp. 57–58.

As a result of the examination of the male genitalia, it is stated that *Pyrausta caffreii,* Flint & Malloch [*R. A. E.*, A, viii, 450], is a synonym of *Loxostege similalis,* Gn.

The species figured under the name of *P. obumbratalis,* Led., is *P. ainsliei,* Heinr. The precise identity of *P. obumbratalis,* Led., cannot at present be ascertained.

ST. GEORGE (R. A.). U.S. Bur. Ent. **Notes on the Periodical Cicada in 1919.**—*Proc. Ent. Soc. Washington, D.C.,* xxii, no. 9, December 1920, pp. 227–231.

Observations made on the life-history of Brood X of *Tibicen septendecim,* L., in Virginia during 1919 are recorded in calendar form.

GAHAN (A. B.). U.S. Bur. Ent. **On the Identity of several Species of Chalcidoidea (Hymenoptera).**—*Proc. Ent. Soc. Washington, D.C.,* xxii, no. 9, December 1920, pp. 235–243.

The Chalcids, the synonymy of which is discussed, include the Pteromalids, *Lariophagus distinguendus,* Foerst., the synonyms of which include *Meraporus calandrae,* How., and *M. utibilis,* Tuck.; and *Merisus isosomatis* of authors, which is not *Stictonotus isosomatis,* Riley, but *M. febriculosus,* Gir. The latter is a parasite of various species of *Harmolita* and of *Mayetiola destructor* (Hessian fly). Its distribution ranges from Maryland to Kansas, but it will probably be found to occur over the whole of the United States and Canada where wheat is attacked by joint-worms and *M. destructor.*

Brooks (F. E.). **Spotted Apple-tree Borer.**—*U.S. Dept. Agric., Washington, D.C.*, Bull. 886, 21st October 1920, 12 pp., 5 plates. [Received 22nd February 1921.]

The Cerambycid, *Saperda cretata*, Newm. (spotted apple-tree borer), occurs locally throughout the apple-growing districts of the central and eastern parts of the United States, and is closely allied in its biology to the round-headed apple-tree borer (*S. candida*). It appears to be entirely absent from many localities within its general range, while in others it is abundant, occasionally replacing to a great extent the round-headed species. In the vicinity of Lansing, Michigan, the author found it vastly outnumbering *Saperda candida*. There it was found in abundance in cultivated and roadside seedling apple trees, and rather less abundantly in wild crab-apple and *Crataegus*. It has also been recorded from juneberry and thorn.

The injury is very similar to that of *S. candida*, except that it usually occurs higher on the trees, the central and upper portions of the trunk and the branches being affected. The eggs are placed between the bark and the wood at the side of the punctures made by the female, and on hatching, the larva begins to feed in this situation. Towards the end of the first season or in the spring of the second the larva enters the wood and works its way to the heart of the branch. Badly infested trees are sickly in appearance, individual branches, and occasionally small trees, dying as a result of attack. The adults issue from the wood by day in spring and early summer, and emergence has been observed from 1st May to the end of June. After emergence the beetles feed on the bark of twigs and leaf-petioles, and occasionally on the leaves. Mating occurs about a fortnight after emergence, and oviposition about a week later. The eggs hatch in about three weeks. The larval period may extend from two to four years. In spring the mature larvae enter the pupal stage, which lasts four to six weeks. The adults remain in the pupal chamber for one to two weeks before emerging.

Woodpeckers appear to be the most effective natural check on this borer, which feeds in positions easily accessible to these birds. During the author's studies every attempt to rear larvae in unprotected trees met with a loss of all the individuals from this cause. On one occasion a newly-emerged female was found in the jaws of a spider, *Xysticus ferox*. In several cases larvae of the clearwing moth, *Aegeria pyri*, Harris, were found as the sole occupants of burrows recently made by *S. cretata*, and there is good reason for believing that they had devoured the original occupants.

There is little doubt that in apple orchards where arsenical sprays are used many adults may be killed, as they feed freely on exposed surfaces. The beetle has a rather prolonged feeding period prior to oviposition, and this affords a chance to kill it with poison sprays before it has provided for a succeeding generation.

While small, the borers may be removed by paring away the bark over their burrows, which can be found by the castings and by the swollen appearance of the wood. Badly infested branches may be removed and burned. Breeding places, such as are provided by neglected seedling apple trees and thorn and wild crab-apple thickets, should not be allowed near orchards.

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HERBERT (F. B.). U.S. Bur. Ent. **The Genus *Matsucoccus*, with a new Species. (Hemip.-Homop. Coccidae, Subfamily Margarodinae).**—*Proc. Ent. Soc., Washington, D.C.*, xxiii, no. 1, January 1921, pp. 15–22, 1 plate.

The genus *Matsucoccus*, erected by Cockerell in 1908 for the reception of *Xylococcus matsumurae* from pine in Japan, is redescribed; two other species infesting pines in America are included in it, a key to them being given. *M. acalyptus*, sp. n., was taken from exposed portions of the needles of the single-leaf pinon (*Pinus monophylla*) in Southern Idaho. *M. matsumurae*, Kuw., occurs on the twigs of pine (*Pinus thunbergii, P. virginiana* and *P. rigida*) in America, where it is causing considerable damage. There is probably only one generation a year, the larvae hatching in the spring and settling on the growing twigs, where they soon become apodous. The gall formation is probably due to the bark growing over the insect.

M. fasciculensis, Herbert, recently described from California on pines, has been made the type of a new genus, *Americoccus*, by MacGillivray.

WALTON (W. R.). **How to detect Outbreaks of Insects and save the Grain Crops.**—*U.S. Dept. Agric., Washington, D.C.*, Farmers' Bull. 835, August 1920, 24 pp., 14 figs. [Received 22nd February 1921.]

This is a revised edition of a bulletin already noticed [*R.A.E.*, A, vi, 14]. The same pests are referred to, and the recommendations made are substantially the same.

BROOKS (F. E.). **Pear Borer.**—*U.S. Dept. Agric., Washington, D.C.*, Bull. 887, 29th September 1920, 8 pp., 3 plates. [Received 22nd February 1921.]

The pear borer, *Aegeria pyri*, Harris, is a native species rather widely distributed in the eastern United States. The caterpillars commonly attack pear, apple, *Sorbus americana* (mountain ash), *Amelanchier canadensis* (juneberry), *Crataegus* sp. (thorn), and other plants. The burrows occasionally extend from the bark slightly into the sap-wood. Injury may occur at any point above the ground except on the smaller twigs. Places with a rough surface and borders of mechanical wounds or of the mines of other borers are specially liable to attack.

Larval activity begins early in the spring, and is marked by the presence of fresh, reddish castings. The caterpillar hibernates in the burrow. Some are mature in autumn, and construct cocoons in spring without further feeding. In West Virginia, caterpillars from early-laid eggs usually transform to adults in the following season, thus having a one-year cycle. Those from late-laid eggs spend two winters in the tree.

The burrows are often opened and the occupants removed by woodpeckers. Perhaps 50 per cent. of the caterpillars and pupae are destroyed by parasites, including *Microbracon* sp., *Phaeogenes ater*, Cress., *Lissonota* sp., *Itoplectis annulipes*, Brullé, *Macrocentrus* sp., *Ephialtes aequalis*, Prov., *Tetrastichus* sp., and *Stilbopoides sesiavora*, Roh.

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The burrows are not always easy to locate, but as a rule exuding frass or moisture reveals them. The caterpillar may be removed with a knife and the place painted with coal-tar creosote, or white lead. Adhesive material will trap many ovipositing females. Penetrating oily or poisonous liquids kill many borers in their shallow mines, as many as 85 per cent. being destroyed by kerosene emulsion and the standard emulsified oil sprays, with small additions of sodium arsenate. Nicotine sulphate washes are less effective, but some coal-tar products destroyed 90 per cent. of the borers without injuring the bark.

WILDERMUTH (V. L.) & GATES (F. H.). **Clover Stem-borer as an Alfalfa Pest.**—*U.S. Dept. Agric., Washington, D.C.*, Bull. 889, 25th October 1920, 25 pp., 6 figs., 1 plate. [Received 22nd February 1921.]

The clover stem-borer, *Languria mozardi*, Latr., is often referred to in literature as a pest of red and mammoth clovers, the larvae subsisting upon the pith of the stems. During recent years, especially in the south-western semi-arid and irrigated regions, the larvae of this Erotylid beetle have become an important pest of lucerne (*Medicago sativa*); they feed on the centre of the stem, causing it to become woody and liable to break off.

The distribution of *L. mozardi* covers practically all the United States, as well as parts of Canada and Northern Mexico. Besides clover and lucerne, there are numerous other food-plants, many being Compositae. A number of these are weeds, the destruction of which will aid in checking the pest.

The average length of the complete life-cycle in Arizona is about 60 days; this period is noticeably less during the first generation, owing to the shorter time between emergence and pairing, in spite of the fact that the egg-stage is longer than in July and August. A minimum life-cycle of 50 days has been noted, and a maximum of 70. The observed average duration of the egg-stage was 3·8 days, of the larval stage 34·5 days, and of the pupal stage 9 days.

There are three distinct generations in the south-western States. The first begins in early May, the second about mid-July, and the third in autumn, though in the field the last two are not separable. In the eastern United States there is only one annual generation, the hibernating beetles appearing in late April or early May and the new adults in August. Hibernation occurs in almost any place, such as fence rows, ditch banks, etc., providing shelter against freezing temperatures. A few records show that this species can occasionally hibernate in the larval stage.

Natural enemies comprise toads, birds, and the Hymenopterous parasites, *Habrocytus languriae*, Ashm., which often infests 30 per cent. of the larvae, *Heterospilus* sp., and *Eurytoma* sp. The value of the last-mentioned is questionable, as it is both primary and secondary, having been also taken from the larvae of *H. languriae*. This also applies to *Eupelmus allyni*, French.

The injury to lucerne and red clover can be partly eliminated by destroying sweet clover, weeds and waste lucerne, and by cutting the hay crop before the larvae have developed. Crop rotation, and clean farming, such as burning rubbish, etc., will also check this pest. It is unable to develop where pasturing is practised continuously.

CHITTENDEN (F. H.) & MARSH (H. O.). **The Beet Leaf-beetle.**—*U.S. Dept. Agric., Washington, D.C.*, Bull. 892, 25th October 1920, 24 pp., 4 figs., 9 plates. [Received 22nd February 1921.]

In the Rocky Mountain States sugar-beets are attacked by the adults, and especially by the larvae, of the beet leaf-beetle, *Monoxia puncticollis*, Say. Prior to 1897 this Chrysomelid had confined its attack to weeds or wild plants. A description of the various stages is given. *M. puncticollis* occurs along the Atlantic sea-board of the United States, in California, and in the alkaline regions of Colorado, Utah, and New Mexico. The favourite food-plants of the adults and larvae are *Chenopodium album* (lamb's quarters), *Dondia* spp. (sea-blite) and sugar-beet. The hibernating beetles appear in March and April, and soon begin ovipositing on the under-side of the leaves. The larvae eat holes in the leaves, and when mature burrow into the ground to a depth of a half to two inches and form cells in which the pupae develop in eight to nine days. Two generations and a partial third occur annually in the Arkansas Valley of Colorado.

The adult beetles hibernate in alkali areas under tufts of grass, heaps of dead weeds, and other rubbish, and their destruction in their winter quarters has proved an effective and practical method of control. The dead grass and weeds should be burned between mid-November and 1st March, and it is necessary that the work should be thoroughly done. Traps, consisting of heaps of weeds or bundles of straw or hay, may be placed, not later than August, so that they may become well settled before the beetles seek them for winter quarters. Fowls in infested fields will also destroy many of the beetles.

The use of arsenicals has not been entirely successful, and is not needed in view of the excellent results obtained by destroying the hibernating pests.

Natural enemies are numerous, and include the Coccinellids, *Hippodamia convergens*, Guér., *H. sinuata*, Muls., and *H. glacialis*, F., which feed on the eggs and young larvae of the hibernated beetles until Aphids become abundant. The nymphs of the Pentatomid bug, *Perillus bioculatus*, F., var. *claudius*, Say, feed on the larvae, and the adult bugs on the beetles. One species of internal parasite, a Tachinid, *Hypostena* sp., was reared. This fly is rare. Toads, poultry and wild birds, and a fungous disease are among the other natural checks.

CHITTENDEN (F. H.) & MARSH (H. O.). **The Western Cabbage Flea-beetle.**—*U.S. Dept. Agric., Washington, D.C.*, Bull. 902, 22nd October 1920, 21 pp., 4 figs., 1 plate. [Received 22nd February 1921.]

The western cabbage flea-beetle, *Phyllotreta pusilla*, Horn, is a most troublesome pest of cabbage, turnips and other cruciferous crops, sugar-beets, other vegetables, and garden plants in the western States. The injury is chiefly due to the attacks of the over-wintered adults during June and July, but more or less injury is done during the growing season. Minute, pit-like holes are eaten in the leaves of young plants, the lower surface being usually selected. Considerable harm is often done to seed-beds. The damage caused by the larvae is negligible.

The entire life-cycle from egg to adult may be passed in about 30 days in June and July, and there are at least three annual generations. In its more northern range *P. pusilla* hibernates under clods,

heaps of weeds, or rubbish, and appears with the first warm days of spring. In the extreme south the beetles are active throughout the year, but reproduction does not occur in winter. In the laboratory both eggs and larvae seemed so susceptible to excessive moisture that irrigation may prove useful against them and also against the pupae in the field.

This pest is singularly free from natural enemies; these include birds, a Braconid parasite, *Perilitus epitricis*, Vier., and Nematodes that infest the adult beetles.

Numerous experiments were made with various sprays and other remedies. Crops may be protected by spraying with lead arsenate, applied at the rate of 2 lb. powder to 50 U.S. gals. water, or by Bordeaux mixture, 4–4–50 formula, these sprays acting as repellents. Nicotine sulphate, half-pint 40 per cent. solution in 50 gals. water with 2 lb. soap added, or tobacco dust, may be used as deterrents. It is not possible, however, to control this pest when it appears in its greatest abundance. It is desirable to keep the plants thrifty and well-watered; mechanical traps and trap-crops can be used with advantage. Clean culture is always advisable, especially the destruction of weeds in and near cultivated fields.

KALMBACH (E. R.). **The Crow in its Relation to Agriculture.**—*U.S. Dept. Agric., Washington, D.C.*, Farmers' Bull. 1102, August 1920, 20 pp., 4 figs. [Received 22nd February 1921.]

The distribution, abundance, life-history, and food habits of the common crow (*Corvus brachyrhynchos*) are dealt with, and methods for protecting crops and poultry are described. The merits and demerits of this bird are considered to be about equally divided. Insects supply about one-fifth of its food. Comprehensive information regarding this portion of its diet has been given already [*R. A.E.*, A, vii, 202].

CARPENTER (C. W.). **Potato Diseases in Hawaii and their Control.**—*Hawaii Agric. Expt. Sta., Honolulu*, Bull. 45, 24th January 1920, 42 pp., 14 plates, 7 figs. [Received 22nd February 1921.]

The insect pests dealt with in this bulletin are *Phthorimaea operculella* (potato-tuber moth), cutworms, army worms, mites and Nematodes, against which general remedial measures are advocated.

CARPENTER (C. W.). **Report of the Division of Plant Pathology.**—*Rept. Hawaii Agric. Expt. Sta. 1919, Honolulu*, 10th September 1920, pp. 49–54, 2 plates. [Received 22nd February 1921.]

The mite previously recorded on potatoes and tomatos [*R. A.E.* A, vii, 196] has been found also affecting sweet peppers in Hawaii. Spraying with sulphur or lime-sulphur proved an efficient remedial measure.

CONRADI (A. F.). **Report of the Entomology Division.**—*32nd Ann. Rept. South Carolina Expt. Sta., 1918–19, Clemson College, S.C.*, December 1919, pp. 41–44. [Received 23rd February 1921.]

The principal project under investigation during the year ended 30th June 1919 was the relation of temperature and moisture to insect activity. Charts covering a period of ten years are now available, and the interpretations obtainable have important economic value

in anticipating insect outbreaks. The work in connection with the permanent establishment of the Coccinellid, *Novius cardinalis*, has been continued. The value of this insect in controlling the cottony cushion scale [*Icerya purchasi*] has been demonstrated, and it is thought that provision can be made to carry it through the winter.

The work of the station as a whole has developed along fundamental lines, and enables the Division to foresee more accurately insect disturbances from year to year and throughout the season.

Conradi (A. F.). **Report of the Entomology Division.**—*33rd Ann. Rept. South Carolina Expt. Sta. 1919–20, Clemson College, S.C.*, December 1920, pp. 41–43.

The work of the station has been continued chiefly along the lines followed in previous years. Much work is being done in connection with the cotton boll-weevil [*Anthonomus grandis*] problem. The period from oviposition to the emergence of adults averages 17½ days; eggs are laid about seven days after emergence, giving a complete life-cycle of 25 days.

Petherbridge (F. R.). **Frit Fly** (*Oscinis frit*) **in Winter Wheat.**—*Ann. App. Biol., Cambridge,* vii, no. 4, February 1921, pp. 363–366.

The experiments here described prove that the larvae of *Oscinella* (*Oscinis*) *frit* are capable of migrating to wheat from grass after the latter is ploughed in. Bastard fallowing is advocated to prevent attack by this pest on winter wheat, although after such a procedure there is always the danger of severe infestation by *Hylemyia* (*Leptohylemyia*) *coarctata* (wheat-bulb fly).

Howard (A.). **The Influence of Soil Factors on Disease Resistance.**—*Ann. App. Biol., Cambridge,* vii, no. 4, February 1921, pp. 373–389, 5 figs.

There seems to be no doubt that the conditions of the active roots profoundly affect the resistance of plants to the attack of pests. Recent experiments confirming this theory are described. Examples are given of the effect of soil aeration in connection with various diseases, and with the insects, *Psylla isitis,* Buckt., on indigo, and *Dysdercus cingulatus,* F., on *Hibiscus cannabinus,* in India. In all cases examined root discolouration precedes and accompanies insect attack. The connection between Aphids and winter irrigation has been observed so frequently that more detailed investigations of the soil, root-system and sap of the affected trees is urgently called for. Examination of the root-system in the case of wheat attacked by termites in Bihar has led to the discovery of the cause and a simple remedy that has since been widely adopted on the indigo estates of this tract. The attack by termites is apparently directly connected with the effect of soil temperature on the plant. Many more examples of disease resistance in other parts of the world must be examined before it is possible to say how far immunity depends on morphological root fitness for the environment and how far it is inherent in the natural resistance of the protoplasm to the invasion of a pest. The object of this paper is to suggest that in future more attention should be paid to general facts of root development and the condition of the absorptive areas of the root-system, both before and during the actual period of establishment of disease.

Dozier (H. L.). **An Ecological Study of Hammock and Piney Woods Insects in Florida.**—*Ann. Ent. Soc. Amer., Columbus, Ohio,* xiii, no. 4, December 1920, pp. 325–380, 22 figs.

In the second part of this paper the relation of insects to the above environment is discussed. Lists are given of those associated with the more important trees.

Peterson (A.). **Some Studies on the Influence of Environmental Factors on the Hatching of the Eggs of** *Aphis avenae* **Fabricius and** *Aphis pomi* **De Geer.**—*Ann. Ent. Soc. Amer., Columbus, Ohio,* xiii, no. 4, December 1920, pp. 391–400, 1 plate.

Further experiments with eggs of *Siphonaphis padi*, L. (*Aphis avenae*, F.) and *A. pomi*, De G., in relation to moisture, show very similar results to those already noticed [*R.A.E.*, A, viii, 45]. During the observations made in the past four years, 1917 to 1920, the percentage of hatchings varied considerably, probably as a result of weather conditions. The percentage is greatly reduced if dry weather prevails during the 10 to 14 days previous to hatching. Conditions producing high evaporation probably make the outer shell of the egg brittle and easily broken by the growing embryo. Early rupture of the outer coat is detrimental, as it exposes the permeable membrane for a longer time to evaporating influences.

Observations were also made with regard to the influence of temperature on the rapidity of the splitting of the outer layer, but no definite statement can be made in this connection, as the factors producing evaporation before the eggs were brought into the laboratory may have been different in the two seasons.

Reinking (O. A.). **Diseases of Economic Plants in Southern China.**—*Philippine Agric., Los Baños,* viii, no. 4, November 1919, pp. 109–134, 3 plates. [Received 28th February 1921.]

In this list of diseases the plants are arranged alphabetically according to their popular names. Although the paper deals primarily with fungous diseases, borers are mentioned as attacking *Citrus* spp. and thus predisposing the trees to the attack of fungi. *Aulacaspis pentagona*, Targ., is recorded as causing severe damage to peach (*Prunus persica*).

Mendiola (N. B.). **A Review of the Rice Investigations at the College of Agriculture.**—*Philippine Agric., Los Baños,* viii, no. 5, December 1919, pp. 145–160. [Received 28th February 1921.]

The chief pest studied in connection with rice investigations was *Leptocorisa acuta* (rice bug), against which several remedial measures that were tried proved unsuccessful. It may be possible, however, by selection, to obtain a strain of rice that would be naturally resistant to the attacks of this bug.

Morrison (H.). U.S. Bur. Ent. **The Nondiaspine Coccidae of the Philippine Islands, with Descriptions of apparently New Species.**—*Phillippine Jl. Sci. ,Manila,* xvii, no. 2, August 1920, pp. 147–202, 1 plate, 40 figs. [Received 28th February 1921.]

The new species described are :—*Lophococcus convexus*, on *Pithecolobium scutiferum* and *Peltophorum ferrugineum* ; *Rhizococcus philippinensis*, on *Ficus* sp. ; *Synacanthococcus bispinosus*, on *Ficus* sp. ;

Tachardia minuta, on mango (*Mangifera indica*); and *Saissetia triangularum* on coconut (*Cocos nucifera*).

Keys are given to the Philippine subfamilies of the COCCIDAE, the Philippine genera of the MONOPHLEBINAE, DACTYLOPIINAE and COCCINAE as well as to the Philippine species of *Icerya, Pseudococcus, Tachardia, Pulvinaria, Ceroplastes, Coccus, Paralecanium* and *Saissetia.*

KARNY (H.). **Some Thysanoptera from the Philippine Islands.**—*Philippine Jl. Sci.,Manila,* xvii, no. 2, August 1920, pp. 203–209, 4 figs. [Received 28th February 1921.]

The species dealt with are *Dinothrips sumatrensis,* Bagn, *D. menodon,* sp. n., and *Dicaiothrips bakeri,* sp. n.

FELT (E. P.). **New Philippine Gall Midges.**—*Philippine Jl. Sci., Manila,* xvii, no. 2, August 1920, pp. 231–234. [Received 28th February 1921.]

The new species described include *Lasiaptera paniculi,* from panicles of *Panicum carinatum*; *Toxomyia brideliae,* on leaves of *Bridelia stipularis*; and *Mycodiplosis spondiasi* from *Spondias mombin.* It is uncertain whether the last-named is a gall-making or predaceous midge.

FIGUEROA (J.). **Cultivo del Trébol.** [Cultivation of Clover.]—*Rev. Agric. Bogotá,* v, no. 9–12, September–December 1919, pp. 560–604. [Received 22nd February 1921.]

The insects injurious to clover in Colombia include *Cantharis erythroscelis,* Berg, a native beetle that appears from about November to January and devours the leaves of clover, lucerne, potatoes, etc. It is advisable to cut down and reap as early as possible any infested clover destined for forage, but if it is required for seed, the only remedy is to keep the soil under constant irrigation and cut the crop when required. Lepidopterous larvae, when very numerous, devour the leaves in great quantities; the best remedy is to take off the crop as lightly as possible, pasturing as many animals as is practicable on the fields. Another method is to mow the clover before it is mature, and a day or two later to pass heavy rollers over the ground, which would kill a large number of the caterpillars. The clover should then be dried and burnt, to destroy the insects in it. One injurious insect [*Bruchophagus funebris*] has been known in the Republic since 1910, and is sometimes very destructive to clover seed; fumigation with carbon bisulphide is recommended, after which the seed should be separated by a fanning machine from the dead insects. *Bryobia pratensis* (red spider) appears in dry summer weather, weaving webs over clover, lucerne, beans, and other plants. These webs should be destroyed with rakes made of thorn branches, and the plants should then be well watered. Poultry are useful in breaking the webs with their feet when allowed to run in the fields.

LOPÉZ (A.). **La Langosta.** [The Locust.]—*Rev. Agric., Bogotá,* v, no. 7, July 1919, pp. 419–422. [Received 23rd February 1921.]

The National Congress has just voted a sum to be used in an anti-locust campaign when found necessary in Colombia. Although locusts do not seem to occur in the inhabited parts at the present time,

there is a very great danger of their early migration from the western side of the Cauca River. The climatic and topographical conditions likely to lead to such an invasion are discussed. There is a fairly general opinion, which the author shares, that locust invasions die out less by reason of the artificial methods employed than as a result of a period of heavy rain. It is known that the insects remain within certain definite zones for a period of years, and only occasionally descend in large swarms into the valleys to the north and south of Colombia. In the author's opinion, it is the rain barrier that exists in the hilly regions all around the locust zones that keeps the insects confined within them. During exceptionally long periods of drought, however, even this barrier region may become dry, and then the locusts will migrate to the valleys, where they find cultivated crops for food and dry conditions favourable to their multiplication. This theory is based entirely upon the influence of rain upon the insects, of which the author has made a personal study. If the theory be true, the obvious remedy is to send a Commission to locate the breeding places, and as an invasion seems to be imminent, work on these lines should be promptly undertaken.

Verwendung von Arsenpräparaten gegen Obstbaumschädlinge. [The Use of Arsenicals against Fruit-tree Pests.]—*Schweiz. Zeitschr. Obst- u. Weinbau, Frauenfeld,* xxx, no. 4, 19th February 1921, pp. 52–56.

Arsenicals have only recently come into more or less general use as insectides on the Continent. In France such insoluble preparations as lead arsenate, Paris green, etc., have been permitted by law since 1916, but soluble compounds are prohibited. This article, intended for Swiss orchardists, describes the spraying methods usual with arsenicals.

Jaarboek van het Departement van Landbouw, Nijverheid en Handel in Nederlandsch-Indië 1919. [Year-book of the Department of Agriculture, Industry and Commerce in the Dutch East Indies, 1919.]—*Weltevreden,* 1920, 387 pp. Price 4 florins. [Received 23rd February 1921.]

The information here given regarding insect pests has already been dealt with from the reports of the various experiment stations, etc.

Cappe de Baillon (P.). **Contributions anatomiques et physiologiques à l'Étude de la Reproduction chez les Locustiens et les Grilloniens. 1. La Ponte et l'Éclosion chez les Locustiens.**—*La Cellule, Lierre and Louvain,* xxxi, no. 1, 1920, pp. 7–245, 8 plates, 15 figs.

This extensive monograph describes the oviposition and hatching of eggs of Orthoptera, both from an anatomical and physiological point of view, and is the result of observations made on over 50 different species.

Picard (F.) & Pagliano (T.). **Sur la Biologie de l'Altise de la Vigne** (*Haltica ampelophaga,* **Guér.**).—*C. R. hebdom. Acad. Sci., Paris,* clxxii, no. 7, 14th February 1921, pp. 399–401.

Observations made on *Haltica ampelophaga* under laboratory conditions show that the females are comparatively long-lived. The

eggs are laid at intervals of one to two days from about April to July, generally in small batches of from four to twenty-five. Each female lays a total of about 500 eggs during the season. Adults from eggs laid in April begin ovipositing about 24th June, the generations thus overlapping. In captivity three partial generations were produced, but under natural conditions probably only two occur. The hibernating individuals represent all existing generations, with a majority of members of the last. This beetle cannot live on *Salix* spp., but will feed readily on purple willow, five-leaved ivy, *Epilobium* and several species of *Oenothera*.

H. lythri has been successfully reared on vine. For various reasons it is thought that *H. ampelophaga* is probably only a subspecies or race of *H. lythri* that has specially adapted itself to vine, and it was found possible to raise hybrids between the two.

Contra nuestras Hormigas. [A Remedy for Ants.]—*Gaceta Rural, Buenos Aires,* xiv, no. 162, January 1921, p. 647.

It is said that a very simple practice for destroying ants' nests is to pass a straw dipped in water through crystallised perchloride of mercury and thrust it into the nest. As a result the ants almost immediately leave the nest and begin to attack and devour each other. It is suggested that this might prove successful against the Argentine ant [*Iridomyrmex humilis*] which is becoming such a pest in Europe and the United States.

Observaciones relativas á las Condiciones meteorológicas en que se efectuaron los Cultivos de Cereales y Leguminosas en el Año agrícola 1919-1920, y su Influencia el las Cosechas. [Observations on the Meteorological Conditions influencing the Cultivation of Cereals and Vegetable Crops in 1919–1920, and their Effect on the Crops.]—*Bol. Agric. Tec. Econ., Madrid,* xiii, no. 145, 31st January 1921, pp. 36–38.

In Mancha and Extremadura locusts and *Aphis fabae* caused much damage to cultivated crops; in Cataluna and the Balearic Islands the chief pests were *Tinea granella* in wheat and rice and *Sitotroga* (*Anacampsis*) *cerealella* in barley; in eastern Andalusia and North Africa *Aphis fabae,* and in western Andalusia *Aelia rostrata,* caused considerable damage. In the Canary Islands Bruchids and Aphids have done some injury.

Schmidt (R.). **Über die Galle des** *Oligotrophus* (*Phegomyia*) *fagicola,* **Kieffer (Houard nr. 1158).** [On the Gall of *O. fagicola.*]—*Sitzungsber. Naturf. Ges., Leipsic,* xliii–xliv (1916–1917), July 1918, pp. 82–85.

The literature concerning *Oligotrophus fagicola,* which produces galls on the leaves of copper beech, is reviewed. This Cecidomyiid pupates in the ground and not, as Ross has stated, in the gall.

Brèthes (J.). **Sección Entomológica.**—*Mem. Trabajos Inst. Biol. Soc. Rural Argentina* (*May 1919 to 30th April 1920*), *Buenos Aires,* 1920, pp. 57–62. [Received 23rd February 1921.]

Much attention has been given during the year to a study of the bagworm, *Oeceticus platensis,* and its parasite, *Parexorista caridei*

[*R. A. E.*, A, viii, 298]. Towards the south of Argentina the bagworms decrease in number, although the damage does not seem to lessen appreciably; in these regions the bagworms sometimes hibernate until the following spring. As the parasites are inactive during the winter, as many as possible of the hibernating larvae in the bags should be destroyed at that time; while a few parasites must inevitably be killed in this way, *P. caridei* will not be injured, as the larvae are then hibernating in the ground. *Tetrastichus platensis* is another parasite that destroys many bagworms.

Diatraea saccharalis has been found for the first time in Saladillo on maize, though it has already occurred in Tucuman. The lucerne caterpillar [*Colias lesbia*] has been found to be attacked by a parasite, to which the name *Apanteles ayerzai* has been given. Many species, both injurious and beneficial, and some that are probably new to science, remain to be studied from the collections sent in during the year.

WAKEFIELD (E. M.). **Diseases of the Oil Palm in West Africa.**—*Bull. Misc. Inform. R. Bot. Gdns., Kew, London,* 1920, no. 9, pp. 306–308, 1 plate.

Oryctes owariensis, P. de B., is recorded as injurious to oil palms in West Africa. The control of this beetle might also reduce the spread of fungous diseases in these palms.

FLETCHER (T. B.). **Report of the Imperial Entomologist.**—*Sci. Repts. Agric. Res. Inst. 1919-20, Calcutta,* 1920, pp. 68–94, 7 plates. [Received 18th February 1921.]

Cotton pests of the year included *Sylepta derogata, Phenacoccus hirsutus* and *P. corymbatus*. *Hibiscus abelmoschus* continues to prove a better trap-crop for *Earias* than either *H. esculentus* or hollyhock. *Microbracon lefroyi*, which continues to be the most prominent parasite of *Earias*, is also chiefly found in pods of *H. abelmoschus*, in company with the bollworms. The species of *Acrocercops* referred to in the previous report [*R. A. E.*, A, viii, 83] has now been named *A. zygonoma*, Meyr. The question of determining the relative immunity of cotton varieties was continued.

Rice borers, as concluded in last year's report, seem to cause relatively little damage in the Pusa district, affecting about 4 per cent. of the crop. The species present include *Schoenobius incertellus* (*bipunctifer*), *Chilo simplex, C. oryzae* and *Sesamia inferens*. The Halticid beetle mentioned in the previous report occurs largely on *Panicum miliaceum*. It is incapable of injuring plants standing in water, but may cause some damage to dry-land paddy and millets.

Sugar-cane pests have been dealt with at length in a previous paper [*R. A. E.*, A, ix, 69]. The lines of work followed since its publication in February 1919 are described. Some further data on the life-histories of the Dynastid beetles, *Alissonotum impressicolle, A. piceum* and *Heteronychus sublaevis* are given; in normal years these are not serious pests of sugar-cane. *Autoserica* sp. was observed gnawing sugar-cane shoots in the same manner as the above beetles; this form of damage may be caused by many Lamellicorn beetles. The Curculionid, *Tanymecus hispidus*, and grubs of *Anomala dussumieri* were recorded as attacking sugar-cane roots. *Argyria tumidicostalis*, Hmpsn., which is one of the most injurious borers in sugar-cane, is now known to occur

at Patna, Jorhat, Dacca, and Sadiya. Every precaution should be taken to prevent its transport in canes exported from Assam and Eastern Bengal to other parts of India. New borers discovered during the year in Gramineous and Cyperaceous plants include *Hypsotropa tenuinervella*, Rag., in stems of *Andropogon squarrosus* and bulbs of Rosha grass (*Cymbopogon schoenanthus*); *Crambus corticellus*, Hmpsn., in stems of *Scirpus corymbosus*; and *Chilo torrentellus*, Meyr., and a Cerambycid, *Lychrosis zebrinus*, in stems of *Saccharum spontaneum*. In the search for alternative food-plants of sugar-cane borers, *Coix lachryma-jobi* var. *aquatica* was found to be a food-plant of *Chilo simplex*, and lemon-grass of *Sesamia inferens*.

Fruit pests of the year include a Lamiid beetle, *Batocera rubus*, the larvae of which bore in mango; a Cecidomyiid, *Procontarinia matteiana*, that makes galls on mango leaves; a Trypetid, *Dacus* (*Chaetodacus*) *zonatus*, for which peach trees were sprayed early in the morning each day with a solution of gur and lead arsenate, and affected fruits were collected and destroyed; a Sphingid, *Langia zeuzeroides*, on apple; the Tortricids, *Tortrix* (*Cacoecia*) *pomivora* and *Ulodemis trigrapha*, Meyr., on apple; and a new and serious apple pest, *Ptochoryctis rosaria*, Meyr., a Xyloryctid moth, the larva of which eats the bark of young apple twigs under cover of a silken tubular gallery. *Helopeltis theivora* (tea mosquito bug) was unexpectedly found sucking young shoots of apple. *Brahmina coriacea*, Hope, *Holotrichia* sp., an undetermined Melolonthid, and a species of *Microtrichia* were all reported as damaging fruit trees.

Among the various insects reared and observed during the year were *Achroia grisella*, F. (wax moth), infesting the hives of honey bees; *Chlumetia transversa*, the larvae of which bore into mango shoots; the black ants, *Camponotus maculatus infuscus*, nibbling egg-plants; the dry-wood borer, *Heterobostrychus aequalis*; *Sinoxylon anale*, which damages wooden packing-cases, brush handles, etc.; the Longicorn, *Stromatium barbatum*, which bores in household furniture; and the cutworms, *Agrotis ypsilon*, *A. flammatra*, and *Euxoa spinifera*, which have occurred in gram fields. The disease of juar (*Andropogon sorghum*) known as "khas" is believed to be due to a minute Cecidomyiid. A new species of *Antispila*, named *A. anna*, Meyr., was sent from Bengal, where it feeds on *Eugenia jambolana*. The work on stored grain pests described in a previous paper [*R.A.E.*, A, ix, 78) has been continued. A study of the Dermestid, *Trogoderma khapra*, has revealed a long life-cycle, from the end of June 1919 to March and April 1920. The moist weather of the rainy season and cold winter weather retarded the development of the larvae.

The work of the year connected with bees, lac, and silk is briefly reviewed.

KUNHI KANNAN (K.). **The Life-history of** *Orthezia insignis* (**Abstract**). —*Rept. Proc. 3rd Ent. Meeting, Pusa, February 1919, Calcutta*, iii, 1920, pp. 857–858.

Orthezia insignis moults three times at intervals of about two weeks. Reproduction begins after from 2 to $2\frac{1}{2}$ months, the total life-cycle being about $4\frac{1}{2}$ months. Experiments to test the transmission of the scales by ants were negative. The insect retards the growth of *Lantana*, and finally causes its death, a bush about 3 feet high and 4 feet in diameter being killed in three years. In captivity the insects did not thrive on coffee or tea plants in pots.

In the discussion following this paper, the opinion was expressed that the introduction of *O. insignis* into India as a check on *Lantana* is inadvisable.

Kunhi Kannan (K.). **The Function of the Prothoracic Plate in** *Bruchus chinensis* **(Abstract).**—*Rept. Proc. 3rd Ent. Meeting, Pusa, February 1919, Calcutta,* iii, 1920, pp. 858–859.

Recent observations show that the prothoracic plate of *Bruchus chinensis* is thrust against the egg-shell, the larvae having no functional legs by which they may get a grip that enables them to use their mandibles, and that it is also fixed at various angles to effect the bending of the head. The structure varies considerably in different species, and further studies of it are being attempted.

D'Abreu (E. A.). **Some Insect Prey of Birds in the Central Provinces.**—*Rept. Proc. 3rd Ent. Meeting, Pusa, February 1919, Calcutta,* iii, 1920, pp. 859–871.

As a result of the examination of the alimentary canals of 600 birds, a list of the insects found, arranged under their natural orders, is given, The list of the birds examined includes 161 species.

Senior-White (R.). **Some Notes towards the Life-history of** *Comocritis pieria,* **Meyrick.**—*Rept. Proc. 3rd Ent. Meeting, Pusa, February 1919, Calcutta,* iii, 1920, pp. 872–875.

Nothing is so far known of the egg-stage of *Comocritis pieria,* Meyr. The author has found this moth only on rubber bark. Should a lichenous patch be met with, it is also eaten, but the line is not diverted for the sake of the lichen. The burrows generally occur between 5 feet and 30 feet above ground level. Tea is apparently not attacked in Ceylon. A pupal chamber is made at the bottom of the burrow. On trees up to about 10 years old pupation may occur in the branch scars. The first larvae were found in January, and they mature and pupate from the third week in July onwards. The pupal period lasts 26 days, and the last adults occur in September. The natural enemies probably include squirrels, small beetles (? Coccinellids) and a Hymenopterous parasite.

Fletcher (T. B.) & Ghosh (C. C.). **Notes on Rearing Insects in Hot Climates.**—*Rept. Proc. 3rd Ent. Meeting, Pusa, February 1919, Calcutta,* iii, 1920, pp. 875–892, 8 plates.

In this paper, which is hardly suitable for an abstract, many points of interest to those engaged in the breeding of insects are dealt with, and much valuable information is given, both with regard to the rearing of specified insects and to the apparatus required.

Beeson (C. F. C.). **Breeding-cages and General Insectary Technique for Wood-borers.**—*Rept. Proc. 3rd Ent. Meeting, Pusa, February 1919, Calcutta,* iii, 1920, pp. 892–895, 2 plates.

Various breeding-cages have been tested for rearing wood-borers, the galvanised iron pattern having been adopted as the most suitable. The construction and advantages of this cage are described, and the best method of recording the correlation of the emergence records of wood-borers is discussed.

Fraser (F. C.). **Spiders as Checks on Lepidopterous Larvae.**—*Rept. Proc. 3rd Ent. Meeting, Pusa, February 1919, Calcutta,* iii, 1920, pp. 898–900.

In observations on larvae of *Acherontia styx* preyed upon by spiders, it was found that the latter will not attack individuals protected by ants. It is considered that about 86 per cent. of the Sphingid larvae are destroyed as they emerge from the eggs, and about 10 per cent. during the first few weeks of the larval period. Similar observations have also been made on *Papilio polytes.*

Prashad (B.). **The Importance of Insects to Fisheries.**—*Rept. Proc. 3rd Ent. Meeting, Pusa, February 1919, Calcutta,* iii, 1920, pp. 906–909.

The importance of insects as food for fish and also as destroyers of organisms forming the food of fish is discussed. The need for systematic scientific investigations into these questions is emphasised, and co-operation between the fisheries department, entomologists and others for this purpose is urged.

Isaac (P. V.). **Some Observations on the Life-history of an Erotylid breeding in Italian Millet.**—*Rept. Proc. 3rd Ent. Meeting, Pusa, February 1919, Calcutta,* iii, 1920, pp. 919–921, 1 plate.

An Erotylid beetle, *Anadastus* sp., has been causing severe damage to the Italian millet (*Setaria italica*) crop at Coimbatore. The eggs are laid singly in the stems from 1 to 6 inches above the soil during the second month of growth. Stems in which the central hollow has begun to appear are generally chosen. The eggs hatch in five to six days, and the larva travels about in the hollow, and on reaching the base, it feeds on the lining of the inner wall. On the second or third day it begins to ring the stem, cutting almost through to the epidermis. The object of the ring is evidently to prevent the plant sap from rising, as moisture kills the larva. Several larvae may be found in one stem, but only one in each internode, and they never bore through to an adjacent one. On completing the ring the larva remains above it. Pupation occurs within the stem after 25 days, and lasts 14 days. The beetles remain about four days in the cell before emerging.

Subramanyam (T. V.). **The Life-history of the *Moringa* Stem-borer.**—*Rept. Proc. 3rd Ent. Meeting, Pusa, February 1919, Calcutta,* iii, 1920, pp. 922–925, 1 plate.

A Lamiid beetle found damaging *Moringa pterygosperma* is probably a species of *Monohammus.* No alternative food-plants have been found. The eggs are laid in excavated hollows singly or in pairs. Egg laying continues for a number of days. The eggs hatch in from two to three days, and the larva immediately begins to bore into the stem, sealing the entrance with excrement. The larval period lasts from two to four months. Pupation in captivity lasted from seven to ten days, but, contrary to expectation, did not occur in the stem.

RAMAKRISHNA AYYAR (T. V.). **Notes on the Life-history of the Pollu Flea-beetle** (*Longitarsus nigripennis*, **Mots.**) **of Pepper.**—*Rept. Proc. 3rd Ent. Meeting, Pusa, February 1919, Calcutta*, iii, 1920, pp. 925–928.

Longitarsus nigripennis, Mots., is one of the causes of "Pollu" disease of pepper (*Piper nigrum*). The eggs are laid singly under the skin of the green berry near its attachment to the spike. The larvae feed on the contents of two or three berries for about 40 to 50 days, and then drop to the soil for pupation ; this occurs at a depth of from 2 to 3 inches and lasts about 10 days ; the adults remain in the soil a day or two longer. After emergence from the soil, they feed voraciously on the tender leaves of the pepper plant. There are apparently two generations a year, the adults of one appearing in October, and of the other in January. As the result of investigations still in progress, it is hoped to prove whether a third generation exists, or whether the insect aestivates in the adult stage from March to June. No other food-plants have yet been found. This pest is most commonly found in shady, damp and cool plots.

Remedial measures suggested include hoeing in September–October and December–January for the destruction of the pupae. Spraying with deterrents to prevent oviposition appeared to be successful in some plots. Investigations on these lines are being continued. So far no natural enemies have been noticed.

KASERGODE (R. S.). **On some of the Bionomics of Bruchidae (Lariadae).**—*Rept. Proc. 3rd Ent. Meeting, Pusa, February 1919, Calcutta*, iii, 1920, pp. 928–931.

As many Bruchids breed in the field, methods of storing to prevent external infection are not in themselves sufficient to avoid the destruction of pulse seeds, and it may be necessary to fumigate the seed directly after harvest.

In 1914 various pulse seeds were collected with the object of investigating the nature and extent of injury by insects alone to stored seed. The seed was kept in sealed tins, and when inspected after a year, peas, *Dolichos lablab* and *Cajanus indicus* were found to be infested with Bruchids, thus proving that infection need not necessarily come from old infested seed of previous years, but may originate in the field.

There is no doubt that Bruchids breed in the green pods in the field. The species dealt with during these observations were *Bruchus* (*Pachymerus*) *chinensis*, *B. theobromae* and *B. affinis*. The last-named is not able to breed in dry seed and has but one generation a year. The other two, however, can totally destroy dry seeds in store. An unidentified Bruchid was found breeding in pods of *Crotalaria juncea*. It has one generation a year ; the eggs and larvae are found in green pods, in which pupation also occurs.

RAMAKRISHNA AYYAR (T. V.). **On the Insect Parasites of some Indian Crop Pests.**—*Rept. Proc. 3rd Ent. Meeting, Pusa, February 1919, Calcutta*, iii, 1920, pp. 931–936.

This list of insect parasites is arranged in tabular form, showing the insect host and its order or family, as well as the group or family to which the parasite belongs, with remarks concerning its distribution, etc. The object of the paper is to draw attention to the importance of

the study of Indian parasitic Hymenoptera. During the discussion following the paper the need for systematic workers on Indian parasitic Hymenoptera and Diptera was emphasised.

DE MELLO (F.). **The Trichonymphid Parasites of some Indian Termites.**—*Rept. Proc. 3rd Ent. Meeting, Pusa, February 1919, Calcutta,* iii, 1920, pp. 1009–1022, 3 plates.

The present researches deal chiefly with the parasites of *Leucotermes indicola,* Wasm. *Trichonympha agilis* is redescribed and compared with the conflicting descriptions of other authors. It is possible that a number of different species or varieties may have been described under this name.

Other parasites of *L. indicola* are *Leidya metchnikowi, L. annandalei, L. kempi* and *L. campanula*; also the Infusoria, *Apalina termitis, Balantidium termitis, Nyctotherus fletcheri, Pyrsonympha grassii* and *Franciella termitis.*

BRUES (C. T.). **On the Bollworm Parasite described as** *Rhogas lefroyi* **by Dudgeon and Gough.**—*Rept. Proc. 3rd Ent. Meeting, Pusa, February 1919, Calcutta,* iii, 1920, pp. 1026–1028.

As a result of recent examinations of material from India, the species described by Dudgeon and Gough from Egypt as *Rhogas lefroyi* [*R.A.E.*, A, ii, 321] has been found to belong to the genus *Microbracon. R. kitcheneri* [*loc. cit.*] also probably belongs to this genus. According to Mr. Fletcher there are at least four or five species of *Microbracon* parasitising *Earias* in India.

ISAAC (P. V.). **Some recently noted South Indian Melolonthidae of Economic Importance.**—*Rept. Proc. 3rd Ent. Meeting, Pusa, February 1919, Calcutta,* iii, 1920, pp. 1028–1029.

The species dealt with are *Anthracophora crucifera,* Oliv., and *Protaetia aurichalcea,* F., on *Lantana* and cholam, *Popillia chlorion,* Newm., the larvae of which damage *Cinchona* roots, as do also the larvae of *Holotrichia repetita,* Sharp, and *Serica nilgirensis,* Shp. A species similar to *H. repetita* has proved injurious to *Cinchona* seedlings in the larval stage. Under laboratory conditions each female laid about 100 eggs. *H. rufoflava,* Brs., was taken near roots of orange plants. It is thought that the larvae eat the bark just below ground-level, causing the death of the tree.

FLETCHER (T. B.). **Note on Plant Imports into India.**—*Rept. Proc. 3rd Ent. Meeting, Pusa, February 1919, Calcutta,* iii, 1920, pp. 1052–1070, 3 plates.

The present situation with regard to the regulations governing the importation of plants into India is discussed. The fumigation boxes in use at various ports are described and illustrated. As the ports of entry are very scattered and the importations of plants at some of them are very small and infrequent, an entomological staff cannot be maintained at each, and the fumigation is therefore carried out by the Customs staff. The necessity for periodical entomological supervision at such ports is, however, emphasised.

GHOSH (C. C.). **Some Aspects of Economic Entomology in India.**—*Rept. Proc. 3rd Ent. Meeting, Pusa, February 1919, Calcutta,* 1920, pp. 1073–1081.

This paper deals with economic entomology in relation to agriculture in India from the point of view of the Indian cultivator. The entomologists' difficulties arising through lack of facilities for proper study, etc., are not apparent to the public, and there is therefore a tendency to belittle the importance of these officers as members of the agricultural department.

If the local conditions and current agricultural practices are not taken into consideration when advocating remedial measures against insects, those recommended are often impracticable, and the cultivators lose confidence in the entomologist. Preventive measures are frequently ignored by cultivators, as a result of their ignorance of insect biology, and progress in education in agricultural economic entomology is urgently needed.

BEESON (C. F. C.). *Hoplocerambyx* **and the Dying-off of Sal.**—*Ind. Forester, Allahabad,* xlvii, no. 2, February 1921, pp. 68–76, 1 chart.

As a result of investigations to ascertain the reason for the dying-off of sal trees [*Shorea robusta*] in large numbers, it was found that factors connected with soil aeration were among the primary causes of this. Borers, such as *Hoplocerambyx spinicornis,* Newm., are essentially secondary factors, though, under epidemic conditions, they may determine the death or survival of a weakened tree. The resistance of the trees is greatly lowered by a series of years of heavy rainfall, which give rise to bad soil aeration. Resistance is marked by a copious excretion of resin that floods the larval galleries and drowns the young larvae. In the case of an epidemic of *Hoplocerambyx,* the trees attacked should be enumerated as soon after the rains as possible, and all parts of the tree down to 18-inch girth removed from the forest before 30th April of the following year. In years of exceptional rainfall the parts of the tree down to 12-inch girth should be removed.

Attention is drawn to a paper by Stebbing, in which it is erroneously stated that *Hoplocerambyx spinicornis* does not occur in the United Provinces at all [*R.A.E.*, A, iii, 154].

JEPSON (F. P.). **Shot-hole Borer Investigations.**—*Trop. Agric., Peradeniya,* lvi, no. 1, January 1921, pp. 23–30, 2 charts.

A final trial was made in July 1920 of Speyer's paint-mixture on tea bushes infested with *Xyleborus fornicatus* (shot-hole borer). Details of the experiment are described. After a discussion of the results, it is concluded that in view of the extremely high cost of this treatment, the insufficient benefits derived, and the damage done to the bushes, it is not to be recommended for use against this pest. A further experiment is to be conducted to test the value of the castor-oil plant as a trap tree. It is contended by some growers that the compulsory eradication of castor in the tea areas has resulted in the borer turning its attention to tea, but there is at present no confirmation of this. An attempt has been made to limit the reproduction of borers by the removal of infested branches at intervals, but it is feared that if this work is carried out thoroughly more damage will be done by the pruning

than by the borers. Manurial experiments are to be arranged to test the effects of nitrogen, potash and phosphoric acid upon borer incidence, and it is hoped that these will be continued over a series of years. It is also intended to study gallery entrance healing in connection with these experiments.

The Drosophilid fly, *Phortica xyleboriphaga*, has been studied in its immature stages. Of 1,300 galleries examined on one estate, 6·8 per cent. contained some stage of the fly, and wherever they were present dead borer larvae were found, but it is not definitely known whether death was caused in every case by the fly, or whether the state of decomposition in which the borers were invariably found had attracted the fly to oviposit there. On one estate a Trogositid, *Nemosoma* ?, was present in such numbers as to exercise a vigorous control over the borer.

An experiment has been planned to try to discover some fertiliser or insecticide that will have a deadly action upon borers in galleries when buried with prunings. The possibility of destroying the ambrosia fungus on which the borers subsist in the galleries is also being considered.

Lounsbury (C. P.). **Fumigation with Liquefied Hydrocyanic Acid.**—Reprint from *S. A. Fruit Grower*, June 1919, 2 pp. [Received 1st March 1921.]

The history of development of the use of liquid hydrocyanic acid for orchard fumigation in California is reviewed [*cf. R. A. E.*, A, iv, 61 ; vii, 228 ; viii, 89]. Until additional means for dealing with storage and transport dangers are evolved, the liquid form cannot be used for citrus orchards in South Africa under existing conditions. It may, however, be used advantageously for the fumigation of buildings in the larger towns.

Lounsbury (C. P.). **Worms in Walnuts.**—Reprint from *S. A. Fruit Grower*, November 1919, 2 pp. [Received 1st March 1921.]

In South Africa the codling moth [*Cydia pomonella*] is almost as serious a pest of walnuts as of apples and pears. In parts of the Oudtshoorn district the damage amounted to 50–60 per cent. of the crop in 1914–15. The present conditions in California are reviewed and remedial measures are advocated [*R. A. E.*, A, vii, 359 ; viii, 238].

Other pests of walnuts in South Africa are *Argyloploce leucotreta* (false codling moth), the ravages of which may probably be prevented by measures applicable to *C. pomonella*, and *Myelois ceratoniae*, which has been recorded as living in seeds of *Robinia*, carob (*Ceratonia siliqua*), and chestnut (*Castanea vesca*) in Central and Southern Europe. This moth probably does not attack fresh fruit.

Mally (C. W.). **The Maize Stalk Borer,** *Busseola fusca*, **Fuller.**—*Union S. Africa Dept. Agric., Pretoria*, Bull. 3, November 1920, 111 pp., 31 figs., 4 plates, 1 chart. [Received 1st March 1921.]

The object of this report is to record all available information on *Busseola fusca*, Full. (maize stalk borer), and to serve as a basis for further studies ; a list of the references consulted is therefore given with a brief note in connection with each [*cf. R. A. E.*, A, i, 144 ; v, 35 ; vi, 153].

The chief pests of maize in South Africa are cutworms, *Heliothis* (*Chloridea*) *obsoleta* (ear worm), *Heteronychus arator* (black beetle), *Strophosomus amplicollis* (snout beetle) and *Busseola fusca,* the last-named being undoubtedly the most serious of these.

The results of field observations show that *B. fusca* is neither two nor three brooded, but a combination of both ; should the moths emerge early in the spring, three generations may occur, but the moths of the third brood will in consequence appear later in the following spring and thus only two broods will occur in that year. Oviposition occurs from the end of October to the end of December according to conditions and locality. The eggs hatch in from 8 to 10 days, and the larval period varies from 30 to 50 days. Pupae of the first spring brood occur from the end of December to January, and adults emerging from them oviposit from the end of January to the first week in February on maturing plants. The larvae reach maturity during March and April. Some of these pupate and emerge as moths, giving rise to a partial third generation. The larvae of these and the remainder of the second brood hibernate in the remains of the plant.

The natural enemies include the pupal parasite, *Exephanes nigromaculatus,* Cam., which is probably widely distributed in South Africa, but does not control the insect ; the larval parasites, *Bracon sesamiae,* Cam., and *Stenopleura* (*Apanteles*) *sesamiae,* Cam. ; and the ants, *Iridomyrmex humilis* and *Dorylus helvolus. Diopsis apicalis,* Dalm., has been associated with *B. fusca,* but this fly is probably attracted to maize stalks by the decay induced by the borer.

No methods are known whereby any of the natural enemies can be utilised effectively, the only reliable remedial measures being cultural and other operations that directly destroy the insect or deprive it of food and shelter. The most suitable line of action must be decided according to local conditions [*loc. cit.*].

McCarthy (T.). **Insects attacking Nut Kernels.**—*Agric. Gaz. N.S.W., Sydney,* xxxii, no. 1, 3rd January 1921, p. 9.

Plodia interpunctella (Indian meal moth), *Tribolium castaneum* (*ferrugineum*) (rust-red flour beetle), *Silvanus surinamensis* (saw-toothed grain beetle) and *Trogosita mauritanicus* (cadelle beetle), are the most common species attacking various kinds of nuts, especially when unshelled. Infestation occurs most frequently in storage in the country of origin, but may also occur as the result of contact with other infested foodstuffs during transit.

Froggatt (W. W.). **"Khapra," an Indian Wheat Pest.**—*Agric. Gaz. N.S.W., Sydney,* xxxii, no. 1, 3rd January 1921, pp. 21–23.

The opinions of previous authors as to the economic importance of the Dermestid, *Trogoderma khapra,* are briefly reviewed [*R.A.E.,* A, v, 126, 359]. This beetle is most injurious to wheat in India during the hottest and driest part of the summer. Owing to the different climatic conditions in Australia, it is thought that the damage caused by *T. khapra* would be less than that caused by weevils in the event of it being accidentally introduced.

FROGGATT (W. W.). **The Blue Oat Mite** (*Notophallus bicolor*, **n. sp.**).—*Agric. Gaz. N.S.W., Sydney*, xxxii, no. 1, 3rd January 1921, pp. 33–34, 1 plate.

Notophallus bicolor, sp. n., was found to be the cause of injury to oat crops during August 1920 in New South Wales. The mites apparently confined their attention to oats, as adjoining fields of barley and wheat were not attacked. Thistles among the infested oats were thickly covered with the mites, but no other weeds were found to be infested. The moist condition and rank growth existing at the time of discovery appear to suit this pest. In view of the drought of the previous season, the normal food-plant of this mite and its place of origin are still uncertain.

A similar mite is reported by French as attacking potatoes, peas, lucerne and other crops in Victoria.

ILLINGWORTH (F. J.). **Cane Grub Investigation.**—*Queensland Agric. Jl., Brisbane*, xv, pt. 1, January 1921, pp. 29–31.

The Tachinid parasite, *Ceromasia sphenophori*, Vill., has become well established, and has been recovered fully 3½ miles from the original place of liberation. As a result of the activities of this parasite, a recent survey revealed an average of only 1 per cent. of canes attacked by the weevil borer, *Rhabdocnemis obscura*, Boisd. The burning of trash on all infested land is still advocated, as it apparently does not injure *C. sphenophori*.

The application of dry arsenic to the soil at the rate of 80 lb. per acre has proved an effective method of destroying all stages of grubs of *Isodon puncticollis*, Macl., in gardens. Further experiments for determining the value of poisons against soil pests are progressing favourably.

ILLINGWORTH (J. F.). **Grasshopper Control in North Queensland.**—*Queensland Agric. Jl., Brisbane*, xv, pt. 1, January 1921, pp. 31–34, 2 plates.

As a rule grasshoppers are of minor economic importance in Queensland, as they are successfully kept in check by natural enemies, but during a recent outbreak remedial measures had to be resorted to at Meringa in the cane fields, and the infestation was successfully checked by the application of Kansas poison bait. Owing to the cheapness of lemons, double the usual number of fruit was used, and this addition apparently increased the attractiveness of the bait.

WATT (R. D.). **Prickly Pear in U.S.A.**—*Science & Industry, Melbourne*, ii, no. 11, November 1920, pp. 679–681. [Received 2nd March 1921.]

The utilisation of prickly pear as stock food by concentration or desiccation is not advocated, but more attention should be given to the plant in its natural state as a reserve for drought periods. By singeing off the spines it is made more attractive and less harmful to stock. In California there is a race of wild cochineal insects that attacks many varieties of *Opuntia*, including *O. inermis*. The species concerned is probably *Coccus confusus*.

Gowdey (C. C.). **Army Fall Worm.**—*Jl. Jamaica Agric. Soc., Kingston,* xxv, no. 1, January 1921, pp. 16–17.

Spraying with lead arsenate at the rate of 2 lb. to 50 gals. of water is advocated against attacks of the fall army worm [*Laphygma frugiperda*]. In the case of sugar-cane or maize, the spray should be forced into the bud or centre of the plant. If acid lead arsenate is used, about ½ lb. of lime should be added to the spray. Poison baits will kill a large number of larvae if the fields are clear of weeds and grass. The pupa may be destroyed by exposure to the sun by means of shallow cultivation. In one district a serious outbreak on maize was checked by this means, aided by natural enemies such as the Tachinid, *Frontina aletiae,* three Proctotrupids and a beetle, *Calosoma* sp.

Corbett (G. H.) & Ponniah (D.). **Alleged Damage caused by Insects on stored Rubber Seed.**—*Agric. Bull. F.M.S., Kuala Lumpur,* viii, no. 2, April-June 1920, p. 95. [Received 3rd March 1921.]

The damage to stored rubber seed attributed to insect attack has proved to be of fungous origin, as although *Tribolium castaneum,* Hbst. (*ferrugineum,* F.) was present, it has been experimentally proved that this beetle is unable to enter sound seed.

Corbett (G. H.) & South (F. W.). **Negative Results of Experiments in the Control of the Moth of** *Brachartona catoxantha,* **Hamps.**—*Agric. Bull. F.M.S., Kuala Lumpur,* viii, no. 2, April-June 1920, pp. 107–110. [Received 3rd March 1921.]

As the result of experiments, light traps and poison baits are not advocated against the adults of *Brachartona catoxantha,* but the moths should be caught during the day by means of hand nets or crushed *in situ* on the palm leaves. This must be done as soon as they appear, as oviposition begins about two days after emergence. Several species of fungi and a Tachinid fly check this pest of coconuts to a certain extent, but the degree of infestation is very variable.

Bliss (A. J.). **The Daffodil Fly.**—*Gardeners' Chron., London,* lxix, no. 1776, 8th January 1921, p. 15.

The daffodil fly (*Merodon*) was less prevalent during 1920, probably owing to weather conditions. The best method of protecting seedlings up to the first year or two of flowering is to cover the ground during the time the fly is on the wing (from about the middle of May) with tiffany tacked to wood battens 12–14 ft. long.

Brotherston (R. P.). **Mealy Bug on Vines.**—*Gardeners' Chron., London,* lxix, no. 1777, 15th January 1921, p. 34.

Fumigation, spraying and attention to cultural details are advocated for the treatment of vines infested with mealy bugs [*Pseudococcus*]. Fumigation with hydrocyanic gas or nicotine should be done before the foliage drops and again before the buds break into leaf. Various commercial washing mixtures and paints are discussed.

HINCHINGBROOKE (W. P.). **Mealy Bug on Vines.**—*Gardeners' Chron., London,* lxix, no. 1779, 29th January 1921, p. 58.

With reference to the preceding paper, successful control of mealy bugs on vines by spraying and dressing with nicotine soap is described.

DUNN (D. H.). **Mealy Bug on Vines.**—*Gardeners' Chron., London,* lxix, no. 1781, 12th February 1921, p. 80.

At Aberystwyth mealy bugs [*Pseudococcus*] have been controlled by fumigating the house, after the grapes are cut and the foliage ripe, with 4 oz. of potassium cyanide (98 per cent.) to every 1,000 cu. ft. During the winter the rods were barked, and then dressed with a strong solution of caustic soda and a little soft soap, working the solution well in with a paint brush. The house was fumigated again with 3 oz. potassium cyanide to 1,000 cu. ft. just before starting the vines. The vines are now dressed annually with caustic soda solution, and are quite free from the pest.

HARTLEY (R. M.). **The Auricula and Woolly Aphis.**—*Gardeners' Chron., London,* lxix, no. 1787, 26th March 1921, p. 152.

Tramia auriculae, a woolly Aphid infesting auriculas, was completely controlled by removing the plants in April from the house in which they had flowered. The flower-stalk and all yellow leaves were pulled off and burnt. The roots were freed from soil, washed in water and then plunged in XL-all liquid insecticide (1 part to 5 of water) for one minute. They were then shaken fairly dry and repotted in pots previously scrubbed with a paraffin and soft-soap mixture, 1 : 30 in hot water.

PTERIS (—). **The Raspberry Gall Fly.**—*Gardeners' Chron., London,* lxix, no. 1788, 2nd April 1921, p. 166.

In cases of attack by *Lasioptera rubi* on raspberry canes, the infested portions of the plant should be cut off and burnt. Early recognition of the presence of this midge should prevent any serious extension of it.

RUSSELL (H. L.) & MORRISON (F. B.). **Pea Moth Investigations and other Insect Pests in 1920.**—*Wisconsin Agric. Expt. Sta., Madison,* Bull. 323, December 1920, pp. 44–46, 1 fig.

The first eggs of the pea moth [*Cydia novimundi*, Heinr.] [*R. A.E.*, A, ix, 100] hatched on 23rd July, and the larvae emerged from the pea pods from 6th to 29th August. Garden and field peas are the only plants at present definitely known to be attacked by this pest. Pods of wild vetch have been found to be infested with a very similar insect, but its identity has still to be proved. The results of experiments with regard to early planting as a preventive measure are not consistent; some of the earliest plots were more heavily infested than those planted at a later date [*cf. R. A.E.*, A, ix, 15]. The presence of the moth in a field depends to a great extent on the direction of the wind and the location of the field with respect to it. Crop rotation is advocated as a remedial measure.

Grasshoppers were unusually abundant in several counties during 1920, the damage in one county amounting to about £20,000. Rye, wheat and oats were attacked, as well as pastures and hay crops.

Heavy infestations of army worms were also reported. The necessity for concerted action and organisation among farmers for combating these two pests is emphasised.

The reappearance of the Hessian fly [*Mayetiola destructor*] is probably due to the rapid increase in the acreage of wheat during the last few years. No remedial measures suitable for Wisconsin conditions have yet been found against the pea aphis [*Acyrthosiphon pisi*], which is responsible for a loss of from 5 per cent. to 50 per cent. in some fields.

COTTON (R. T.). **Four Rhynchophora attacking Corn in Storage.**—*Jl. Agric. Res., Washington, D.C.*, xx, no. 8, 15th January 1921, pp. 605–614, 4 plates.

The species dealt with are an Anthribid, *Araecerus fasciculatus* (coffee bean weevil), and the Curculionids, *Caulophilus latinasus* (broad-nosed grain weevil), *Calandra* (*Sitophilus*) *oryzae* (black weevil) and *C.* (*S.*) *granaria*. The immature stages are described and illustrated, and keys are given by which the various species may be easily distinguished.

MILLS (R. R.). **The Relation of Birds to Crops.**—*Agric. Gaz. Canada, Ottawa*, viii, no. 1, January–February 1921, pp. 69–71.

The value of birds as destroyers of agricultural pests is emphasised, and their protection is advocated.

TOWER (W. V.). **Report of the Entomologist.**—*Rept. Porto Rico Agric. Expt. Sta. 1919, Mayaguez*, 15th October 1920, pp. 21–25. [Received 8th March 1921.]

Experiments in connection with the transmission of mottling disease of sugar-cane by several species of leaf-hoppers, *Pseudococcus sacchari* (mealy-bug) and *Diatraea saccharalis* (moth borer) all proved negative.

Grape-fruit was heavily infested with thrips, but apparently no injury resulted.

CORDLEY (A. B.) & JARDINE (J. T.). **Department of Entomology.**—*Rept. 1918–1920, Oregon Agric. Expt. Sta., Corvallis*, January 1921, pp. 59–63.

Investigations were begun in 1919 in connection with the artificial propagation and distribution of beneficial predaceous and parasitic enemies of the apple leaf-roller [*Tortrix argyrospila*] and of apple Aphids, and are still in progress.

The prune root borer [*Aegeria opalesens*] causes an annual loss of about £8,000 in Oregon, but as a result of present investigations it is hoped to reduce this by about 80 per cent.

The ravages of *Tortrix argyrospila* and *T. rosaceana* may be reduced by from 50 to 90 per cent. by means of oil sprays in April. Calyx sprays of oil, lead arsenate and Black-leaf 40 killed about 33 per cent. of the young larvae. Heavy oils give better results than light oils, and the application should be made as near the hatching period as possible. Earlier applications require a higher concentration of the spray.

Outbreaks of Aphids were checked by autumn spraying. *Aphis sorbi* has been experimentally reared on apple throughout the summer without any indication of the appearance of the true sexual forms in the autumn, and all individuals were killed by the severe winter. In the field the winter is passed on plantain. This species has also been found infesting wild crab (*Malus rivularis*). Studies on the relation of the activity of *Aphis pomi* to environmental factors are yielding valuable information.

Minor pests recorded are pear thrips [*Taeniothrips inconsequens*], codling moth [*Cydia pomonella*], grasshoppers, filbert bud mite [*Eriophyes avellanae*] and a Cerambycid boring in gooseberry.

Osservatorio Autonomo di Fitopatologia, Turin. Monthly leaflets nos. 1–10, January–November 1920, 48 pp.

The injurious insects reported during the year included :—

Lepidoptera : *Cossus cossus* on apple and birch ; *Cnethocampa pityocampa* on pine ; *Clysia ambiguella* and *Polychrosis botrana* on vine ; *Aegeria* (*Sesia*) *asiliformis* on poplar ; *Cydia funebrana* on apricot ; *C. splendana* on chestnut ; *C. pomonella* on apple and pear ; *C.* (*Grapholita*) *nebritana* on peas ; *Malacosoma* (*Gastropacha*) *neustria* on pear ; *Nygmia phaeorrhoea* (*Euproctis chrysorrhoea*) on chestnut and pear ; *Hyponomeuta malinellus* on apple ; *Pieris brassicae* on cabbage ; *Porthetria* (*Lymantria*) *dispar* on pear ; *Procris* (*Ino*) *ampelophaga* on vine ; and *Zeuzera pyrina* on beech.

Coleoptera : *Anthonomus pomorum* on apple ; *Balaninus nucum* on hazel ; *B. elephas* on chestnut ; *Cetonia hirtella* on vine ; *Galerucella luteola* on elm ; *Haltica oleracea* on cabbage ; *Epicometis hirta* on pear and vine ; *Scolytus* (*Eccoptogaster*) *scolytus* on elm ; *Bruchus* (*Laria*) *irresectus* in beans ; *Lytta vesicatoria* on ash ; *Byctiscus betalae* (*Rhynchites betuleti*) on poplar and vine ; *Saperda carcharias* on poplar ; and *Scolytus* (*Eccoptogaster*) *rugulosus* on cherry.

Hymenoptera : *Eriocampoides limacina* (*Eriocampa cerasi*) on pear.

Orthoptera : *Gryllotalpa gryllotalpa* on potato.

Rhynchota : *Aonidia lauri* on laurel ; *Brevicoryne* (*Aphis*) *brassicae* on artichoke ; *A. fabae* on beans ; *A. persicae* on peach ; *Aspidiotus hederae* (*nerii*) on *Aucuba* and oleander ; *Aulacaspis pentagona* on mulberry, lilac, jasmin, mandarin orange and peach ; *A. rosae* on rose ; *Chionaspis euonymi* on *Euonymus* ; *Ceroplastes rusci* on fig ; *Chrysomphalus dictyospermi* on lemon ; *Chermes* (*Adelges*) *abietis* on fir ; *Eriosoma* (*Schizoneura*) *lanigerum* on apple ; *Leucaspis pusilla* on pine ; *Lepidosaphis ulmi* (*Mytilaspis pomorum*) on pear and willow ; *L. beckii* (*M. citricola*) on orange and lemon ; and *Physokermes piceae* on fir.

Diptera : *Acidia heraclei* on celery ; *Contarinia pisi* on peas ; and *Rhagoletis cerasi* on cherry.

Mites : *Eriophyes avellanae* on hazel ; *E. vitis* on vine ; *E. tristriatus* on walnut ; *E.* (*Phytoptus*) *pyri* on pear and vine ; and *Tetranychus telarius* on vine and horse chestnut.

FULMEK (L.). **Die Milbenschwindsucht des Hafers.** [The Mite Disease of Oats.]—*Nachrichten Deutschen Landw.-Ges. f. Österr.*, 1919, no. 1, p. 6. (Abstract in *Biedermann's Centralbl., Leipsic,* xlix, no 9, September 1920, pp. 349–351.)

The oat mite, *Tarsonemus spirifex,* has been recorded from France, Germany, Holland and Sweden. In 1918 the author found it in

Austrian Silesia. The injury is characterised by the fact that the ears remain totally or partially hidden in the sheath, the whitish transparent mites being found on the inner side of it. The injury usually appears towards the end of June and spreads slowly, continuing up to the harvest. Shade favours the spread of the injury. The damage has been reported as amounting to 2–10 per cent., but in Holland 90 per cent. has been said to occur, and in France a 100 per cent. infestation has been recorded, involving a loss of perhaps three-quarters of the crop. White varieties of oats suffer less than black or late-ripening ones. Winter oats are seldom affected, and only in very dry years. Wheat and barley are not much attacked, and there is no record concerning rye. In wet years *T. spirifex* is said not to occur. Korff supposes that the mite hibernates in the sheath and is brought to the fields in manure, but it is possible that hibernation also occurs in the field, wild plants allied to oats being the natural food-plants from which the mite migrates to oats. A succession of oat crops increases the trouble.

Remedial measures include thorough manuring with saltpetre, irrigation, crop rotation (lucerne, etc.), early sowing (ensuring vigorous growth at the critical time), deep ploughing, and the avoidance of all straw and seed from infested fields.

GLEISBERG (W.). **Gefahren für den Kohlbau.** [Dangers to Cabbage Cultivation.]—*Deutsche Landw. Presse, Berlin,* xlvii, no. 103, 29th December 1920, pp. 705–706, 2 figs.

The gall-midge, *Contarinia torquens,* de Meij., which destroys the hearts of cauliflowers, causes such serious losses in Upper Silesia that cultivation of this crop has been given up in many cases. As it occurs in other parts of Germany, attention is drawn to the severe outbreaks in Holland between 1897 and 1901.

Owing to its preference for sheltered situations, *C. torquens* does more injury in early beds than in open fields. In 1920 March was a warm month, and the first plants set out were infested, so that the second generation of the midge appeared in June, when the first usually occurs. The resulting increase is a menace to cultivation in 1921.

In the district under observation areas treated with lime suffered least. It seems established that the cultural malpractices that favour the disease *Plasmodiophora brassicae* and the presence of *Phorbia* (*Anthomyia*) *brassicae* (cabbage fly) also favour *C. torquens.*

Success was attained in Holland by spraying once a week with a tobacco decoction (6 parts by weight of tobacco leaves in 100 parts water). This treatment should begin with the first seedlings to prevent oviposition, and seedlings must be carefully watched for any signs of infestation, any affected plants being destroyed.

BRÈTHES (J.). **La Vaquita de la Acacia.** [*Chalepus medius,* Chap., on *Robinia.*]—*Anales Soc. Rural Argentina, Buenos Aires,* lv, no. 2, 15th January 1921, pp. 39–41, 2 figs.

The Hispid, *Chalepus medius,* Chap., causes considerable damage in Argentina to *Robinia pseudacacia,* upon which it is found almost exclusively. A general description of the adult beetle

is given. A similar beetle is *Uroplata costipennis,* which lives on *Sida rhombifolia.* The eggs of both are laid on the underside of the leaves of their respective food-plants, and the larvae feed on the parenchyma of the leaves, being sheltered between the two surfaces. Both species pupate within the leaves. The respiration of the plant is interfered with in this way. The remedy advocated is spraying with Bordeaux mixture.

v. Bargen (A.). *Heliothis armigera,* **Hb., bei Hamburg.**—*Internat. Ent. Zeitschr., Guben,* xiv, no. 22, 5th February 1921, p. 176.

Attention is drawn to the exceptional occurrence of *Heliothis obsoleta* (*armigera*) var. *fusca,* Ckll., in the vicinity of Hamburg. The species was identified from a moth reared from a larva taken on tomato on 1st August 1920. Pupation occurred on 5th August, and the adult emerged on 28th August. This moth is very rare in North Germany.

Menzel (—) & Garretsen (—). **Sluipwespen in Hileud Koeda** [Hymenopterous Parasites in *Stauropus alternus.*]—*De Thee, Buitenzorg,* i, no. 4, December 1920, p. 110, 1 plate.

Tea planters are warned against destroying the white cocoons of Hymenopterous parasites of the caterpillars, often present during an outbreak of *Stauropus alternus.*

Menzel (—) & Garretsen (—). **Eitjes van Sprinkhanen op Theebladeren.** [Orthopterous Eggs in the Leaves of Tea.]—*De Thee, Buitenzorg,* i, no. 4, December 1920, pp. 111–112, 2 plates.

Blister-like swellings on the edges of tea leaves proved on investigation to be insect eggs, and the larvae that hatched out were found to be those of an Orthopteron.

Palm (B. T.) & Mjöberg (E.). **Bestrijding van Rupsenvraat in Deli-Tabak. II. Rijkelijke Bespuiting van plantbare Bibit.** [Measures against Caterpillar Injury to Tobacco in Deli. II. The thorough Spraying of Seedlings ready for Planting.]—*Deli Proefstation, Medan,* Vlugschrift no. 6, January 1921, 3 pp., 1 fig.

The three most dangerous tobacco pests on the east coast of Sumatra are *Heliothis, Phytometra* (*Plusia*) and *Prodenia* ; the chief injury to leaves is due to them. Their extraordinary fertility and rapid development account for the enormous numbers that appear. Other factors favourable to them are the almost complete absence of natural enemies, the abundance of food during the tobacco season, and the favourable climate.

Measures against the first generation are therefore necessary, and the methods hitherto adopted must be improved or changed. The beds containing seedlings ready for planting out on the following day must be copiously sprayed with a solution of 2 per cent. lead arsenate and 3 per mille soft soap until they are white all over. The nozzle must not be held too close or the tender plants may be injured. The coating must be quite dry before the plants are watered prior

to planting out, or better still, the seed-beds may be well watered before spraying. This procedure ensures that only protected plants are placed in the field. Under normal conditions this procedure affords protection for 6–8 days.

Loos (K.). **Zug eines mächtigen Nonnenschwarmes über das Glatzer Gebirge in die Tschechoslowakei.** [The Migration of an enormous Nun Moth Swarm over the Glatz Mountains into Czechoslovakia.] —*Vereinsschr. Forst-, Jagd- u. Naturk., Prague,* 1920–21, no. 4–6, pp. 60–62.

The passage of a huge swarm of nun moths [*Liparis monacha*] from Prussian Silesia into Czechoslovakia was observed in the afternoon of 18th July 1920. It was estimated to be about 15 feet deep and 600 yards wide, and was observed for 20 minutes. It is noteworthy that the flight occurred by day, with the wind, and over a peak more than 4,000 feet high.

Menzel (R.). **Ueber die Nahrung der freilebenden Nematoden und die Art ihrer Aufnahme.** [On the Nutrition of free-living Nematodes and the Method of Ingestion.]—*Verhandl. Naturf. Ges., Basel,* xxxi, 1919–20, pp. 153–188, 5 figs.

The observations and experiments described in this paper confirm those already made by Cobb with regard to predatory Nematodes. Representatives of the genera *Mononchus, Tripyla* and *Trilobus* have been proved to feed on invertebrates, and may be useful for the biological control of species that are harmful to agriculture [*cf. R.A.E.*, A., ix, 97].

Lesne (P.). **Un Foyer de Multiplication de la Mouche des Fruits** (*Ceratitis capitata,* **Wied.) aux Environs de Paris.** [A Breeding-ground of *C. capitata* in the Neighbourhood of Paris.]—*C. R. hebdom. Acad. Sci., Paris,* clxxii, no. 8, 21st February 1921, pp. 490–491.

Attention is drawn to the fact that *Ceratitis capitata,* Wied., has apparently become established in the region of Asnières and Courbevoie. Larvae, presumably of the second generation, were found in a late variety of pear in September. The first generation probably attacked apricots in July.

Berlese (A.). **Acari, Myriopoda et Pseudoscorpiones hucusque in Italia reperta.** [Italian Acari, Myriopoda and Pseudoscorpions.] —*Redia, Florence,* xiv, no. 1–2, 10th February 1921, pp. 77–105.

This is a reprint of the index, with revised nomenclature, of the species in the author's work under the above title, begun in 1882 and suspended in 1903. This has been found necessary owing to the abundance of material, and the continuance of the work, at least on the old lines, is scarcely possible.

Del Guercio (G.). **Specie nuove e nuovi Generi per l'Afidofauna italica.** [New Species and Genera in the Italian Aphid Fauna.]—*Redia, Florence,* xiv, no. 1–2, 10th February 1921, pp. 107–136, 1 plate.

Morphological and systematic notes are given on the following Aphids :—

Rhopalosiphum trilineatum, sp. n., on wild *Chrysanthemum* ; *Anuraphis fasciatus,* sp. n., and *Anuriella dorsolineata,* gen. et sp. n., on lucerne (*Medicago sativa*) ; *Pentaphis viridescens,* sp. n., on the roots of grasses ; *P. apuliae,* sp. n., on *Cichorium intybus* ; *Tetraneura reticulata,* sp. n. ; *T. flavescens,* sp. n., on the roots of *Hordeum murinum* ; and *T. agnesii,* sp. n., on the inflorescences of the olive in Liguria.

Eucarazzia, gen. n., is erected with *E. picta,* sp. n., as the type, and two species of the genus *Rhopalosiphum, R. calthae,* Koch, and *R. najadum,* Koch, are placed in it. A key to these three species is given.

Teodoro (G.). **Sulla Embriologia delle Cocciniglie.** [The Embryology of Coccids.]—*Redia, Florence,* xiv, no. 1–2, 10th February 1921, pp. 137–141.

The author finds that observations published by him in 1915 generally agree with those independently made by Strindberg and published at a later date, evidently without knowledge of the former work. Attention is drawn to some important conclusions that may be drawn from Strindberg's researches. The author's work dealt with the viviparous species, *Coccus* (*Lecanium*) *hesperidum,* L., and *Aspidiotus hederae,* Vall., and with the oviparous ones, *Pulvinaria camelicola,* Sign. (*floccifera,* Green), *P. vitis,* L. (*betulae,* L.), *Saissetia* (*Lecanium*) *oleae,* Bern., *Eulecanium* (*L.*) *persicae,* F., and *L. corni,* Bch. Strindberg studied *Saissetia* (*L.*) *hemisphaerica,* Targ., an oviparous species.

Berlese (A.). **Centuria quinta di Acari nuovi.** [Fifth List of One Hundred new Acari.]—*Redia, Florence,* xiv, no. 1–2, 10th February 1921, pp. 143–195.

One hundred new Acari from various parts of the world are described.

Ferrière (C.). **Un nouveau Chalcidien à développement polyembryonique.**—*Verh. Schweiz. Naturf. Ges., Aarau,* ci, 1920, pt. 2, p. 226.

A new Chalcid, a species of *Copidosoma,* is recorded as parasitising *Depressaria alpigerella,* Frey, on *Laserpitium siler* in the Engadine. From 37 to 120 adults may emerge from one larva. This Chalcid is attacked by the hyperparasites, *Tetrastichus* sp. and *Pteromalus* sp. Other parasites of *Depressaria* are *Eulophus ramicornis,* F., *Pezomachus* sp. and *Phaeogenes planifrons,* Wesm.

Caesar (L.). **Spraying Lesson from 1920.**—*Canad. Hortic., Peterboro, Ont.,* xliv, no. 1–2, January–February 1921, pp. 3–4, 1 fig.

As a result of spraying in 1920 some of the crops yielded from 95 to 98 per cent. of absolutely clean fruit. Most of the sprays used

gave excellent results, and it was found that calcium arsenate may be safely used with lime-sulphur if 3 to 4 lb. of hydrated lime are added to every 40 gals. of liquid. The success of remedial measures depends greatly on weather conditions. It is suggested that dusting should be done in fine weather after 7 p.m. and before 8 a.m.

ARMSTRONG (W. W.). **Dusting 80 Acres of Peaches.**—*Canad. Hortic., Peterboro, Ont.*, xliv, no. 1–2, January–February 1921, p. 5.

Excellent results were obtained against peach curculio [*Conotrachelus nenuphar*] and other pests by dusting with 80 per cent. sulphur, 10 per cent. lead arsenate and 10 per cent. lime. The first application was made in June; 16 hours were required to cover 80 acres. A second application was made about eight days later. The ultimate cost of dusting as compared with spraying is about the same.

LOCHHEAD (W.). **A Quarter Century of Lime-sulphur.**—*Canad. Hortic., Peterboro, Ont.*, xliv, no. 1–2, January–February 1921, p. 6.

The evolution of the use of lime-sulphur against San José scale [*Aspidiotus perniciosus*] is reviewed. It is a most valuable insecticide and fungicide, but for use against scale-insects and codling moth [*Cydia pomonella*] the addition of lead arsenate or calcium arsenate is necessary. Nicotine extract should also be added if Aphids are numerous.

SANDERS (G. E.). **Dusting to Date in Nova Scotia.**—*Canad. Hortic., Peterboro, Ont.*, xliv, no. 1–2, January–February 1921, p. 7.

Copper-arsenic dust, made up of 10 lb. dehydrated copper sulphate, 5 lb. calcium arsenate and 85 lb. hydrated lime, has proved to be cheaper than and quite as efficient as a liquid spray in the control of fungous diseases, but no dust mixture has yet proved to have the value of a liquid spray against Aphids, red bug [*Heterocordylus*], green apple bug [*Lygus*], etc.

MACGILLIVRAY (A. D.). **The Saw-flies (Tenthredinoidea) collected by the Canadian Arctic Expedition, 1913-18.**—*Rept. Canad. Arctic Exped., 1913–18, Ottawa*, iii, pt. G., 3rd November 1919, pp. 3g–19g. [Received 8th March 1921.]

Of the 18 species recorded, 17 are described as new, including:—*Euura abortiva* from galls on leaves of *Salix reticulata*, adults emerging in July; *E. arctica* on *S. reticulata*; *Pontania atrata* and *P. lorata* on creeping willow (*S. arctica*); *P. delicatula* on *S. reticulata*; *P. quadrifasciata*, cocoons of which were found in old Cerambycid burrows in the bark of white spruce, and *P. trifasciata* on *S. richardsoni*.

BRUES (C. T.). **The Parasitic Hymenoptera collected by the Canadian Arctic Expedition, 1913-18.**—*Rept. Canad. Arctic Exped., 1913–18, Ottawa*, iii, pt. G., 3rd November 1919, pp. 21g–24g. [Received 8th March 1921.]

An Ichneumonid, *Dioctes modestus*, sp. n., reared from galls from *Salix*, probably produced by a saw-fly, is described.

Ferris (G. F.). **Report upon a Collection of Coccidae from Lower California.**—*Stanford Univ. Pubns., California,* Biol. Sci., i, no. 2, 1921, pp. 61–132, 53 figs.

Of the 85 species of Coccids dealt with the following are described as new :—*Steatococcus tabernicolus,* gen. et sp. n., on *Prosopis* sp. ; *Orthezia caudata* on a Composite, probably *Encelia palmeri* ; *Asterolecanium cristatum* on *Heteromeles arbutifolia, Jatropha canescens,* and other plants ; *Eriococcus paucispinus* on *Celosia floribunda* ; *E. tillandsiae* on *Tillandsia recurvata* ; *Fonscolombia peninsularis* on *Asclepias subulata* ; *Xerococcus fouquieriae,* gen. et sp. n., on *Fouquieria peninsularis* ; *Phenacoccus franseriae* on *Franseria* sp. and other plants ; *Aclerda attenuata* on *Distichlis spicata* and *Arundo* ; *Pulvinaria peninsularis* on *Philibertia tomentella* and other plants ; *Toumeyella cerifera* on *Albizzia occidentalis* ; *Protodiaspis lagunae* on *Quercus brandegeei* ; *Ancepaspis novemdentata* on *Lysiloma* sp. ; *Diaspis simmondsiae* on *Simmondsia californica* ; *Pseudodiaspis elaphrii* on *Elaphrium microphyllum* ; *P. ruelliae* on *Ruellia* sp.; *P. magna* on an undetermined shrub ; *P. prosopidis* on *Prosopis* sp.; *Chionaspis distichlii* on *Distichlis spicata* ; *Lepidosaphes acuta* on an undetermined shrub ; *L. calcarata* on *Haematoxylon boreale, Acacia flexicaulis* and other plants ; *L. obtecta* on *Atriplex* and *Acacia* ; *L. peninsularis* on *Porophyllum gracilis* and *Asclepias subulata* ; *Odonaspis litorosa* on *Rachidospermum mexicanum* ; *O. fistulata* on *Distichlis spicata* ; *Aspidiotus chortinus* on *Chaetochloa caudata* ; *A. pedilanthi* on *Pedilanthus macrocarpa, Populus* and other plants ; *Chrysomphalus enceliae* on *Encelia palmeri* ; and *C. induratus* on *Pinus cembroides, Quercus brandegeei,* and other plants.

Possibly some of these may eventually prove to be identical with species described from Mexico.

Departmental Activities : Entomology.—*Jl. Dept. Agric., Union S. Africa, Pretoria,* ii, no. 2, February 1921, pp. 109–113, 1 fig.

Owing to the activities of the parasites *Scutellista cyanea* and *Aphycus lounsburyi,* the black scale *Saissetia oleae* is seldom found in orchards in South Africa. *A. lounsburyi* has now also become established in California. Consignments of Coccinellids [*Novius cardinalis*] were sent to Brazil and Ceylon for the control of the Australian bug [*Icerya purchasi*]. The menace of the pink bollworm [*Platyedra gossypiella*] is emphasised by the finding of the pest in a consignment of cotton in Portuguese East Africa [*R. A.E.,* A, ix, 98]. The cotton originated in Angola, where the occurrence of *P. gossypiella* has apparently not been recognised.

There is every reason to think that the parasite [*Aphelinus mali*] of the woolly Aphis [*Eriosoma lanigerum*], introduced from America, will become established in Africa.

The San José scale [*Aspidiotus perniciosus*] has been recorded from four centres in the Orange Free State. Winter spraying and general care of the trees is advocated against this pest.

Lema bilineata (tobacco slug) is causing uneasiness amongst growers of Cape gooseberries in the Bathurst district, Cape Province [*cf. R. A.E.,* A, ix, 186].

FELT (E. P.). **Insects and the State.**—Separate from *N.Y. State Mus., Albany, N.Y.*, Bulls. 219, 220 (15th Rept. of Director, 1918), 1921, 7 pp.

The importance of the insect fauna of the United States is discussed, and the number of species represented in, and the value of, the New York State collection are described. The natural resources of the State offer large fields of investigation to the entomologist. It is remarked that the occasional outbreaks of previously almost unknown and obscure species, such as the importance assumed by *Pyrausta nubilalis* (European corn borer)—a genus hitherto considered of little or no economic importance—illustrates in a convincing manner the need for studying some of the comparatively unknown or neglected groups of insects in view of possible future emergencies.

THEOBALD (F. V.). **The Woolly Aphid of the Apple and Elm** (*Eriosoma lanigera,* **Hausm.**). **Part I.**—Separate from *Jl. of Pomology* [*sine loco*], ii, no 2 [n.d.], 20 pp., 8 figs. [Received 10th March 1921.]

The introduction and early history of *Eriosoma lanigerum,* Hausm., in Britain is discussed. As this Aphid is found on wild crab-apple in both America and Europe, the author is inclined to doubt whether it is an introduced species in the latter continent.

For many years the life-cycle in Britain was assumed to be known, but the information was imperfect, and the fact that it migrates from the elm to the apple in July alters the correct time for spraying and explains many past failures in treatment. Eriosomatines differ from most Aphids in laying but a single egg, both male and female being produced on the primary food-plant by the alate autumn or return migrants.

The correct life-cycle of *E. lanigerum* with its normal double food-plant has been described in America [*R.A.E.*, A, v, 476]. The author has observed the cycle to be the same in Britain. That is to say, the primary food-plant is the elm (*Ulmus*), where the egg-stage is found in winter on the wood of suckers and in crevices of the bark near the ground. The eggs hatch from early March to April, and the larvae wander about until they settle on a tender, unfolding leaf. They grow slowly at first, but by May the majority have become stem-mothers, ensconced in a curled leaf. This curling must not be confused with the elm-leaf curl caused by *E. ulmi,* L., which migrates to the roots of *Ribes* and becomes *E. fodiens.* In June and early July the apterae in the elm-leaf rosettes transform to nymphs, and in July assume wings and migrate from the elm. These are the summer migrants (called in America spring migrants). From this time until September no stage of this Aphid seems to occur on elms. These alatae represent a third generation. They are viviparous, and when transferred to the apple, produce living young that become typical woolly Aphids. This, however, will not happen in every case experimentally. During September a certain number of woolly Aphids on the apple become nymphs, and form the return alate females that migrate during September and October, many of them straying, but some settling on elms to continue the life-cycle. These return migrants can easily be distinguished by their shorter antennae. On the elm they give rise to living young that develop into the arostrate, oviparous males and females, and these produce the few ova from which the life-cycle starts.

This was probably the original and normal life-cycle, but whether the root-system alone of the apple was used as the summer abode, or both root and trunk, is not known. Most of the Eriosomatines certainly pass to a subterranean stage only, and the author believes that this is the normal life of *E. lanigerum*. From this normal life-cycle others have originated, and the Aphid is known to live in four different ways:—permanently on the apple above ground, permanently on the apple below ground, migrating between the root and stem of apple, and living between the elm and apple. It has also been observed in America migrating to mountain ash (*Pyrus americanus*) and to *Crataegus*. The author has proved experimentally that *E. lanigerum* can reproduce for at least ten years on apple, without any sexual revival from the elm.

An observation is recorded of an egg of *E. lanigerum* laid on the apple and not on the elm; this is evidently unusual, but occurs occasionally both in Europe and America. The distinguishing features of the forms of *E. lanigerum* found on the elm and on the apple are described.

Many records of the prevalence of the root form are quoted, though this is very difficult to estimate. Reinfestation from the soil after apple trees have been cleaned by spraying and painting is well known, and no certain method of killing the Aphids in the soil has been devised. Vaporite, naphthaline and carbon bisulphide have all proved unsuccessful in this respect. In America, tobacco waste has been found beneficial. Several growers in England have reported much success with tanglefoot bands. If the bands are left on all the year, it seems possible to catch all the normal ascending forms and any that may descend from the progeny produced by the elm migrants.

The appearance of Aphids in large numbers occurs spasmodically in certain years, but the factors regulating these general or local outbreaks are unknown. The author is convinced that the soil status has much to do with such increase, in conjunction with certain climatic conditions. The chief means of dissemination of the insect by natural factors include the flight of the alate females, wind carrying the apterae in detached wool from the trees, and birds and insects carrying the Aphids on their bodies. The most important artificial mode of distribution, however, is undoubtedly by means of plants, especially on nursery stock. In examining young stock before planting, it is essential to inspect the root system as well as the rest of the tree. It is believed that until some apple stock has been found upon which the root form cannot subsist, the pest will continue in Britain, and will cause serious general or local epidemics. The relative immunity of different varieties is discussed. Irish Peach, Northern Spy and Winter Majetin are varieties of apple that are reported to be immune from the root form, and Jonathan apples, grown on aphis-proof stock from California are said never to be infested. The damage done by *E. lanigerum* is described.

Natural enemies in Britain seem to be limited almost entirely to birds; these include tits in winter, the tree-creeper, chaffinchs and sparrows. Insect enemies on apple are almost negligible, but on elm Braconid parasites and Syrphid predators destroy large numbers. From the curled elm leaves, *Catabomba pyrastri, Syrphus balteatus* and *S. ribesii* have been bred. Coccinellid larvae also attack the Aphid colonies on elm leaves to a less extent.

Pear trees are occasionally attacked by a woolly Aphid in Britain, but the author has failed to infest them artificially with *E. lanigerum.* It seems probable that the Aphid on pear is a distinct species, but the point cannot be settled until the alate forms are found. In America, pears are attacked by a quite distinct species, *E. pyricola,* Baker.

Collinge (W. E.). **The Starling : Is it injurious to Agriculture ?**—*Jl. Ministry Agric., London,* xxvii, no. 12, pp. 1114–1121, 4 figs.

Owing to its enormous increase during recent years, the starling is becoming a serious menace to agriculturists and fruitgrowers. The injurious insects devoured by it only form 26·5 per cent. of its diet. It has been calculated that 36·5 per cent. of its food is beneficial to the agriculturist, 41 per cent. injurious, and 22·5 per cent. neutral. Suggestions are made for reducing its numbers.

Fletcher (T. B.) & Inglis (C. M.). **Some Common Indian Birds : No. 6. The White Wagtail** (*Motacilla alba*) ; **No. 7. The Magpie Robin or Dayal** (*Copsychus saularis*).—*Agric. Jl. India, Calcutta,* xv, pt. 6, November 1920, pp. 592–594 ; xvi, pt. 1, January 1921, pp. 4–6, 2 plates.

Motacilla alba feeds chiefly on small insects, such as beetles, ants and various caterpillars, many of which are injurious to crops. As this wagtail is not a permanent resident and does not breed in India, it is not protected by law, except in Bengal and Burma.

The food of *Copsychus saularis* includes grasshoppers, crickets, ants, weevils and other beetles, as well as a few bees, wasps and cutworms. The bees are probably not taken alive.

Ramakrishna Ayyar (T. V.). **Some Local Practices prevalent in South India in the Control of Insect Pests.**—*Agric. Jl. India, Calcutta,* xvi, pt. 1, January 1921, pp. 40–51, 3 plates.

The methods of dealing with insect pests practised by the natives in various parts of South India are reviewed. Many of these are apparently empirical, crude, and often meaningless, but some may prove useful as a basis from which scientific remedial measures may be developed. In certain villages grain is kept free from pests by storing it in underground pits. A small quantity of pure mercury placed in the bin is said to be an effective preservative of stored food-stuffs.

Dietz (W. G.). **A New Species of Coptodisca (Lepid).**—*Canad. Ent., London, Ont.,* liii, no. 2, February 1921, p. 44.

Coptodisca kalmiella, sp. n., is described from New Jersey, mining in leaves of *Kalmia angustifolia.*

Weiss (H. B.) & Beckwith (C. S.). **Notes on** *Coptodisca kalmiella,* **Dietz, a Leaf-miner of** *Kalmia angustifolia.*—*Canad. Ent., London, Ont.,* liii, no. 2, February 1921, pp. 44–45.

The larvae of *Coptodisca kalmiella* probably hibernate in their mines in the leaves of *Kalmia angustifolia.* They drop to the ground prior to pupation, the latter stage requiring about two to three weeks.

The adults appear about 20th June. The hibernating larvae probably emerge from eggs laid in July. In Pennsylvania, as many as 12–14 mines have been noticed in one leaf.

Parornix (*Ornix*) *kalmiella* is also recorded as mining in leaves of this shrub. The larvae are found in August and September, and the adults in the following May.

GÁNDARA (G.). **El Gusano del Algodon** (*Aletia argillacea* **Hüb.**). **Desarrollo de la Plaga del Gusano del Algodon en el Sur del Estado de Oaxaca.** [The Cotton Worm (*Alabama argillacea*). Its Development in the South of the State of Oaxaca.]—*Revista Agric., San Jacinto, D.F.*, v, no. 5, 1st September 1920, pp. 375–377. [Received 14th March 1921.]

The biology of *Alabama argillacea* (cotton worm) is described. The life-cycle in Oaxaca (Mexico) on an average covers some 60 days, the egg-stage occupying 3, the larval 30, the pupal 15, and the adult, previous to oviposition, 12 days. There may be from three to five generations, according to temperature and weather. It is considered very probable that the moth has some alternative food-plant in this region, and by some growers it is thought to be maize, the irrigated crop of which would enable the insect to survive during February, March and April.

NUÑEZ (A.). **La Palomilla** *Gelechia cerealella.*—*Revista Agric., San Jacinto, D.F.*, v, no. 5, 1st September 1920, pp. 377–379, 3 figs. [Received 14th March 1921.]

The successful fumigation with carbon bisulphide of maize infested with *Sitotroga* (*Gelechia*) *cerealella* is described.

RUBY (J.). **La Lutte contre les Sauterelles dans les Bouches-du-Rhône.**—*Progrès Agric. & Vitic., Montpellier*, lxxv, no. 11, 13th March 1921, pp. 254–259, 2 figs.

The remedial measures against *Dociostaurus maroccanus* undertaken in the south of France [*R. A.E.*, A, vii, 432; ix, 137] are discussed, and it is suggested that poison baits should form the principal remedial measure in future campaigns. The ability to forecast the extent and position of any outbreak in 1921 would be of great value in regulating preventive work.

POUTIERS (R.). **Contre la Mouche de l'Olivier.**—*Rev. Hortic., Algiers*, xxv, no. 1, January 1921, pp. 1–3.

The information here given with regard to the application of the Berlese remedies against the olive fly [*Dacus oleae*] in Italy has been noticed elsewhere [*R. A.E.*, A, ix, 110, etc.].

RUBY (J.). **A propos de la Lutte contre la Mouche des Olives.**—*Rev. Hortic., Algiers*, xxv, no. 1, January 1921, pp. 3–4.

In support of a recent paper by Turinetti on the efficacy of arsenical treatment [*R. A.E.*, A, ix, 110] against *Dacus oleae*, the conclusions arrived at as a result of observations made in 1907–12 are quoted [*cf. loc. cit.*, i, 174].

Paillot (A.). **Mécanisme de l'Immunité humorale chez les Insectes.**—*C. R. hebdom. Acad. Sci., Paris,* clxxii, no. 7, 14th February 1921, pp. 397–399.

As a result of further investigations on the immunisation of the blood of *Euxoa (Agrotis) segetum* against *B. melolonthae non-liquefaciens* γ, it is thought that granular transformation and bacteriolysis may occur irrespective of any cellular activity or even the action of a special antibody. These two phenomena appear to be the last phases of a series of colloidal reactions between the organisms or their products and certain constituents of the blood. Attention is drawn to the striking analogy between the two reactions, viz., bacteriolysis and the phenomenon of dispersion.

Paillot (A.). **Contribution à l'Etude de l'Immunité humorale chez les Insectes.**—*C. R. hebdom. Acad. Sci., Paris,* clxxii, no. 9, 28th February 1921, pp. 546–548.

Subsequent experiments are said to have confirmed the hypothesis propounded in the preceding paper.

Guillemet (P.). **Rational Methods against Locusts in Morocco.**—*La Colonisation Française au Maroc, Casablanca,* i, 1920, pp. 4–6. (Abstract in *L'Agric. Colon., Florence,* xv, no. 2, February 1921, p. 116.)

The anti-locust methods employed in Morocco are vexatious to the population and insufficient. A new organisation must be created and placed under a specialist. The policy of employing forced labour must be abandoned. Premiums must be offered for information relating to oviposition and hatching. The apparatus used must be improved; the flame-throwers developed during the war are much superior to those used up to now in Morocco. An efficient anti-locust service will be expensive, but worth the money.

Quanjer (H. M.). **De "Degeneratieziekten" van de Aardappelplant.** [The "Degeneracy Diseases" of the Potato Plant.]—*Vakblad voor Biologen, Helder,* ii, nos. 7 & 8, March–April 1921, pp. 97–104 & 117–121.

Of the five or six existing forms of these diseases, two, leaf-curl disease and mosaic disease, have been studied sufficiently to permit of some information being given here. The experimental work with plant-bugs and other insects has not yet yielded definite results. In this connection no important results have attended attempts to obtain sap, such as *Myzoides persicae* and other Aphids feed on, from diseased plants, and to transmit the infection by this means. In the case of the mosaic disease of tobacco, which resembles that of the potato, infection by means of sap is easily accomplished.

Durand (A.). **Traitements préventifs contre l'Eudémis et la Cochylis.** [Preventive Measures against *Polychrosis botrana* and *Clysia ambiguella.*]—*La Vie Agric. & Rur., Paris,* xviii, no. 11, 12th March 1921, pp. 171–173, 2 figs.

The increasing importance of *Polychrosis botrana* in the vineyards of Southern France, where formerly *Clysia ambiguella* was the chief

pest, has made it imperative to practise remedial measures against both of these moths. The usual methods for combating an outbreak, as well as preventive measures, the value of which is emphasised, are described.

NEWELL (W.). **Report of the Plant Commissioner for the Biennium ending 30th April 1920, and Supplementary Reports.**—*Qtrly. Bull., Florida State Plant Bd., Gainesville,* v, no. 2, January 1921, pp. 37–126.

The main lines of work indicated in the last biennial report [*R. A. E.*, A, vii, 213] have been continued. The quarantine and other rules passed by the Florida Plant Board are quoted, and the work of the quarantine department is reviewed and summarised in a list including all pests intercepted, with their place of origin. As exports of cotton, cotton seed, etc., to the south have been made from various parts of Louisiana that have been found infested with the pink bollworm [*Platyedra gossypiella*], further restrictions have been made in this respect. Other important work of the quarantine department has been the prevention of additional introductions of the mosaic disease of sugar-cane and of gipsy moth [*Porthetria dispar*] and brown-tail moth [*Nygmia phaeorrhoea*] and other pests and diseases.

Nursery inspection has been thoroughly carried out. To prevent the spread of cottony cushion scale [*Icerya purchasi*], all food-plants coming from infested localities are required to be scrubbed with an insecticide before removal. The Australian Coccinellid, *Novius cardinalis,* is also being distributed in large numbers for its control. The cultivation and distribution of the fungi, *Aschersonia aleurodis* and *A. flavocitrina*, for the control of *Dialeurodes citri* (citrus white-fly) and *D. citrifolii* (*Aleurodes nubifera*) (cloudy-winged whitefly), respectively, have been continued.

Xylomyges eridania (semi-tropical army worm) threatened severe damage to the castor bean, cotton and sweet potato crops, but the invasion was checked by the efforts of the Plant Board. The sweet-potato weevil [*Cylas formicarius*] has been prevented from spreading by the strict enforcement of quarantine rules, destruction of its food-plants (particularly morning-glory [*Ipomaea*]), the use of weevil-free slips for planting, and fumigation of sweet potatoes before removal from any weevil-infested area. The eradication measures described in the last report [*loc. cit.*] were repeated.

The eradication of the banana root borer [*Cosmopolites sordidus*] has progressed so satisfactorily that, apart from a few isolated cases, no infestations are known to occur in the State at the present time. To prevent the introduction of the black fly [*Aleurocanthus woglumi*] into Florida, fruit arriving from localities known to be infested with this pest is not allowed to enter if the consignment includes any leaves, twigs or branches, unless such consignment has been subjected to fumigation with hydrocyanic acid gas. *Platyedra gossypiella* (pink bollworm) has not as yet appeared in Florida, but the situation in Texas renders the continuation of strict precautions necessary. It is hoped to obtain a satisfactory degree of control of the boll weevil [*Anthonomus grandis*] along new lines.

WATSON (J. R.). **Notes on some Florida Weevils.**—*Florida Ent., Gainsville*, iv, no. 3, January 1921, pp. 33–35.

Among a number of Rhynchophora recently collected in Florida were :—*Araecerus fasciculatus*, De G. (coffee-bean weevil), on avocado and Japanese persimmon ; *Epicaerus formidulosus*, Boh., which is commonly found on cotton, where it is frequently mistaken for the boll weevil [*Anthonomus grandis*],—it is sometimes very destructive to young pepper plants, which it punctures at, or just below, the ground-level, and it also attacks peas, tobacco, velvet beans and several Composites, being active from April to November ; *Eudiagogus rosenschoeldi*, Fhs., on oak ; *Derelomus basalis*, Lec., usually occurring on *Asimina parviflora* (dwarf papaw), and also taken on wild plum, velvet beans and blossoms of *Cephalanthus* ; *Anthomus* (*Tachypterus*) *quadrigibbus*, Say (apple curculio), on cotton ; *Anthonomus signatus*, Say, which does not seem to attack strawberries in Florida, but is abundant in blossoms of *Crataegus* in March ; *Centrinus perscillus*, Gyll., on *Cassia* sp., and reported as feeding on cotton ; *Odontocorynus selebrosus*, Casey, on cotton ; and *Chalcodermus collaris*, Horn, on maize and cotton.

WATSON (J. R.). **New Thysanoptera from Florida, viii.**—*Florida Ent., Gainesville*, iv, no. 3, January 1921, pp. 35–39.

Keys are given to the North American species of *Heterothrips*, *Eurythrips* and *Haplothrips*. Among the new species described is *Euthrips grandioculus*, taken on grass.

SEVERIN (H. C.). **The Plum Web-spinning Sawfly.**—*South Dakota State Entomologist, Brookings*, Tech. Bull., no. 1, August 1920, 53 pp., 11 figs. [Received 17th March 1921.]

The plum web-spinning sawfly, *Neurotoma inconspicua*, Norton, is generally distributed over South Dakota, and has been found in the neighbouring states and also in Massachusetts and Southern Manitoba. The larvae feed upon a number of species of *Prunus*, causing serious damage to plum trees and sandcherry bushes by devouring the leaves and by spinning webs over them.

The adult sawflies appear during the latter part of May or early June. The female lays an average of 46 eggs, which hatch in about a week. The larvae are gregarious, and after a destructive feeding period of 13 to 23 days they drop to the ground, enter it to a depth of $1\frac{1}{2}$ to 10 inches, and hollow out a cell, in which the remainder of the year is spent. In the following spring the larvae pupate, the pupal stage lasting 7 to 10 days.

A Tachinid, *Eubrachymera debilis*, Towns., is a parasite of the larvae, and may sometimes destroy as many as 50 per cent. of them. An unidentified fungus occasionally kills the hibernating larvae and pupae, and a small mite has been found attached to the larvae and adults, but neither is of importance in controlling the pest. Quite an important role is, however, played by predaceous enemies. Larvae of *Chrysopa*, and nymphs and adults of the bug, *Podisus maculiventris*, Say, make their way into the webs to feed on the sawfly larvae, and ants, varieties of *Formica rufa*, L., and *Lasius niger*, L., attack them both on the ground when they are full fed, and also on the trees if

they are not protected by a good covering of web. Spiders occasionally kill the adults, and damsel-flies and ladybirds (*Adalia bipunctata*, L.) the larvae, but they produce little or no effect in the natural control of the sawfly.

Spraying experiments were carried out against *N. inconspicua*, both with stomach poisons and contact insecticides. The former were much more effective in killing the larvae; Paris green, calcium arsenate, magnesium arsenate and zinc arsenite caused considerable scorching to the trees, but lead arsenate was quite satisfactory. In dust form it was also effective, though it did not penetrate the webs quite so well as the spray.

The spray should be made of ½ lb. of the powder or 1 lb. of the paste to 50 U.S. gals. of water, the dust of 1 lb. of the powder to 15 lb. of air-slaked lime or powdered sulphur. Both spray and dust killed 100 per cent. of the pest.

Severin (H. C.). **Eleventh Annual Report of the State Entomologist of South Dakota for the Period ending 30th June 1920.**—*South Dakota State Coll., Brookings,* 1920, 40 pp., 5 figs. [Received 17th March 1921.]

Inspection of nurseries in South Dakota has been thoroughly carried out, and a list is given of the pests found, with their food-plants. The importance of educating the public in economic entomology and plant pathology is emphasised, and an account is given of the lectures, etc., given and the publications issued to this end. The research problems that have been dealt with are outlined. Data concerning *Neurotoma inconspicua* have been published [*see* preceding paper]. *Gryllus assimilis*, F. (common field-cricket), caused considerable damage, especially to seeds and grain. Two egg-parasites of it were discovered, namely, *Ceratoteleia marlatti*, Ashm., and a new species of *Paridris*, of less importance. Remedial measures against the crickets include ploughing or disking and harrowing in autumn all fields that have shown injury and the edges of fields and roadsides, in order to destroy the eggs, renovation of lucerne fields in autumn, and the burning of piles of old hay or lucerne where crickets have probably collected. When the crickets are abundant in fields, poison bait should be used [*R.A.E.*, A, v, 382]. *Meromyza americana*, Fitch (wheat-stem maggot) has been studied. Two parasites, *Microbracon meromyzae*, Gah., and *Coelinidea meromyzae*, Forbes, were found destroying the larvae, and the mite, *Pediculoides ventricosus*, is predaceous on them.

The pests of raspberries, blackberries and dewberries include *Oberea bimaculata*, Ol. (raspberry cane borer), of which the life-cycle occupies two years. Eggs are laid in late June or July in the pith of the cane, and the larvae, which hatch in two weeks, feed on the pith and work downward. They pass the first winter in the canes, and in the following spring work more rapidly, gnawing openings at intervals through which the excrement is ejected. Usually before the fruit matures the upper parts of the injured canes are killed. This pest passes the second winter as a full-grown grub in the stem below ground, and pupates in the following spring, the beetles appearing in June and July. If the canes show signs of wilting at the tips in July and are found to be girdled, the tips should be cut off two or three inches below the girdle and burnt. Canes that are a year old and are dying should be cut off close to the ground and burnt.

Various leaf-rollers attack raspberries more particularly, the commonest being *Tortrix* (*Archips*) *rosaceana*, Harr. (oblique-banded leaf-roller), which passes the winter in the egg-stage on the cane. In spring the larvae hatch from the egg-masses and feed on the foliage, later rolling the leaves to form shelters in which they pupate, and from which the moths emerge. Lead arsenate, 1½ lb. paste or ¾ lb. powder to 25 U.S. gals. water, should be sprayed on the bushes when the larvae are first noticed, and again a week later if necessary. If only a few bushes are attacked, hand-picking should be practised.

Monophadnus rubi, Harr. (raspberry sawfly) in the larval stage attacks the foliage of raspberries, and to a less extent of blackberries and dewberries, sometimes causing complete defoliation. These sawflies usually appear early in June and oviposit in the leaf tissues, on which the larvae feed. These are full-grown in South Dakota by mid-July, and descend into the ground to a depth of several inches, where they pupate in the following spring and emerge as adults in June. A spray of 1 oz. hellebore to 1 U.S. gal. of water is recommended against the larvae; ½ lb. lead arsenate or 1 lb. paste to 50 U.S. gals. of water is a successful remedy, but cannot be used when the fruit is ripening.

Tetranychus telarius, L. (red spider) punctures the leaf-tissues of all three species of cane, causing the leaves to become mottled and die. The usual sprays for this pest are recommended.

Oecanthus nigricornis, Wlk. (tree-cricket) is the most injurious pest of raspberries, and also injures blackberries and dewberries by the oviposition punctures of the females, which often girdle the canes until they split open or die. The winter is passed in the egg-stage, nymphs hatching in June. All canes bearing eggs should be cut out and burnt, either late in the year, after the first heavy frost, or in early spring before the eggs hatch. All weeds that might serve as sites for oviposition in the vicinity should be raked up and burnt before winter.

HASEMAN (L.). **Insect Pests of Field Crops.**—*Missouri Agric. Expt. Sta., Columbia*, Bull. 170, April 1920, 39 pp., 36 figs. [Received 18th March 1921.]

A brief description is given of numerous insects and the injury they cause, with suggestions for their control.

The species recorded as attacking maize are :—*Aphis maidiradicis*, Forbes (corn-root aphis) ; *Diabrotica longicornis*, Say ; *D. duodecimpunctata*, Ol. ; *Lachnosterna* spp. ; *Crambus* sp. ; *Sphenophorus aequalis*, Gyl. ; *S. parvulus*, Gyl. ; *Blissus leucopterus*, Say (chinch bug) ; and *Heliothis obsoleta*, F. (corn-ear worm), *Cirphis* (*Leucania*) *unipuncta*, Haw. (army worm), and other Noctuids. Pests of wheat are :—*Mayetiola* (*Cecidomyia*) *destructor*, Say (Hessian fly) ; *Harmolita* (*Isosoma*) *tritici*, Fitch (wheat joint-worm) ; *Macrosiphum granarium*, Buckt. ; *Toxoptera graminum*, Rond. ; *Contarinia* (*Diplosis*) *tritici*, Kby. (wheat midge) ; *Laphygma frugiperda*, S. & A. (fall army worm) ; and *Meliana albilinea*, Hb. (wheat-head army worm). Forage crops are attacked by *Hypera* (*Phytonomus*) *punctata*, F. (clover-leaf weevil), *Loxostege similalis*, Gn. (webworm) and *Hypsopygia costalis*, F. (clover hay worm); while the chief pests of grasses are Jassids, Noctuids, the grasshoppers, *Melanoplus femur-rubrum* and *M. differentialis*, and *Cirphis unipuncta*. Cotton is attacked by *Alabama argillacea*

(cotton worm), and *Heliothis obsoleta*. The pests of stored grain and seeds are :—*Silvanus surinamensis* (saw-toothed grain beetle) ; *Calandra granaria* (granary weevil) ; *Tenebroides mauritanicus* (cadelle) ; *Bruchus* spp. ; *Sitotroga cerealella* (Angoumois grain moth) ; *Plodia interpunctella* (Indian meal moth) ; *Ephestia kühniella* (Mediterranean flour moth) ; and *Pyralis farinalis* (meal snout moth).

MUMFORD (F. B.). **Work and Progress of the Agricultural Experiment Station for the year 1st July 1918 to 30th June 1919.**—*Missouri Agric. Expt. Sta., Columbia*, Bull. 172, June 1920, 48 pp., 7 figs. [Received 18th March 1921.]

In the section of this bulletin dealing with the activities of the Entomological Department the various investigations undertaken are briefly outlined. Experiments for the control of the corn-ear worm [*Heliothis obsoleta*] show that dusting is cheaper than spraying, but that neither method completely destroys this moth, although its ravages in the treated areas are thereby greatly reduced.

The melon aphis [*Aphis gossypii*] can be controlled by spraying with nicotine sulphate ; this spray also gave the best results against the squash stink-bug [*Anasa tristis*]. A spray consisting of 2 lb. lead arsenate and 50 U.S. gals. of water is advocated against the striped cucumber beetle [*Diabrotica vittata*].

The best results in the control of codling moth [*Cydia pomonella*] were obtained with a disc nozzle at a pressure of 85 lb., the percentage of end worms being 1·89, as against 8·74 with a pressure of 200 lb. with the same nozzle, or 11·01 with similar pressure and Bordeaux nozzle. The San José scale [*Aspidiotus perniciosus*] is the most serious pest in Missouri, but owing to systematic inspection work and co-operation, it has been practically eradicated from nurseries.

Nursery and Orchard Insect Pests.—*Missouri Agric. Expt. Sta., Columbia*, Bull. 176, October 1920, 35 pp., 32 figs. [Received 18th March 1921.]

The insect pests are arranged under the crop attacked, with a brief description of injury and remedial measures. The species dealt with include the apple pests :—*Eriosoma* (*Schizoneura*) *lanigerum* (root louse) ; *Saperda candida* (round-headed borer) ; *Chrysobothris femorata* (flat-headed borer) ; *Scolytus rugulosus* (shot-hole borer) ; *Aspidiotus perniciosus* (San José scale) ; *Ceresa bubalus* (buffalo tree-hopper) ; *Tibicen septemdecim* (periodical cicada) ; *Alsophila pometaria* and *Palaeacrita vernata* (canker worms) ; *Thyridopteryx ephemeraeformis* (bagworm) ; *Tortrix* (*Archips*) *argyrospila* (leaf-roller) ; *Mineola indiginella* (leaf-crumpler) ; *Empoasca mali* (leaf-hopper) ; *Empoa rosae* (rose-leaf hopper) ; *Lygus pratensis* (tarnished plant-bug) ; *Cydia* (*Carpocapsa*) *pomonella* (codling moth) ; *Conotrachelus nenuphar* (plum curculio) ; *Enarmonia prunivora* (lesser apple worm) ; and *Anthonomus quadrigibbus* (apple curculio).

Eriocampoides limacina (pear slug) is recorded on pears ; *Aegeria* (*Sanninoidea*) *exitiosa* (peach-tree borer), *Anarsia lineatella* (peach-twig borer) and *Anuraphis* (*Aphis*) *persicaeniger* (black peach aphis) on peaches ; *Aphis setariae* (rusty brown plum aphis) on plums, cherries and peaches ; *Myzus cerasi* (cherry aphis) and *Aspidiotus forbesi* (cherry scale) on plums and cherries. Grapes were attacked by

Aspidiotus uvae (grape scale), *Typhlocyba comes* (grape leaf-hopper), *Polychrosis viteana* (grape-berry moth) and *Craponius inaequalis* (grape curculio); gooseberries and currants by *Pteronus ribesii* (imported currant worm) and *Myzus ribis* (currant aphis); raspberries by *Oecanthus nigricornis* (snowy tree-cricket); strawberries by *Aphis forbesi*, *Ancylis comptana* (leaf-roller), *Anthonomus signatus* (strawberry weevil) and *Tyloderma fragariae* (crown borer).

SULLIVAN (K. C.). **An Investigation of the Dipping and Fumigation of Nursery Stock.**—*Missouri Agric. Expt. Sta., Columbia*, Bull. 177, December 1920, 36 pp., 5 figs. [Received 18th March 1921.]

As a result of experiments with various dipping fluids for San José scale [*Aspidiotus perniciosus*], details of which are described, the greatest success was obtained with miscible oil at the strength of 1 : 12 or 1 : 15; only the tops, however, should be dipped, so as to minimise injury to the plants. Hydrocyanic acid gas is most effective when used upon dry plants at the strength of 1 : 1 : 3. Lime-sulphur used at 1 : 9 gave perfect results on pears and plums, but injured the plants. It is advisable to treat all nursery stock that has been subjected to attack, even though not actually infested, before placing it on the market.

HASEMAN (L.). **Bagworms destructive in Missouri.**—*Missouri Agric. Expt. Sta., Columbia*, Circ. 92, March 1920, 4 pp., 4 figs. [Received 18th March 1921.]

This is a popular account of the life-history and control of the evergreen bagworm [*Thyridopteryx ephemeraeformis*, Haw.] [*R. A. E.*, A, iv, 239]. This moth was very abundant in Missouri in 1919.

HASEMAN (L.). **The European Corn Borer.**—*Missouri Agric. Expt. Sta., Columbia*, Circ. 94, April 1920, 4 pp., 1 fig. [Received 18th March 1921.]

The existence of *Pyrausta nubilalis* in Missouri has not yet been proved, and to prevent its spread from the eastern areas of infestation, a quarantine has been promulgated prohibiting the movement of any material likely to harbour this moth. Special provision is made for the shipment of shelled maize.

Federal and State Laws regulating the Propagation and Distribution of Nursery Stock.—*Missouri Agric. Expt. Sta., Columbia*, Circ. 99, October 1920, 24 pp. [Received 18th March 1921.]

The present Federal quarantines and other regulations affecting the importation of stock from abroad and the transportation of it in the United States, as well as various State laws and regulations, are briefly dealt with.

The Missouri State quarantine against the European corn borer [*Pyrausta nubilalis*] is given verbatim.

KNIGHT (H. H.). **Hemiptera of the Family Miridae.**—*Ohio Jl. Sci., Columbus*, xxi, no. 3, January 1921, pp. 107–112, 1 fig.

This list of CAPSIDAE collected by the Katmai expeditions enumerates eight species, making a total of 16 species that are known to occur

in Alaska. One species is new, one has not before been recorded from the Nearctic region, and two are new records for Alaska. The species of economic interest recorded are *Lygus pratensis oblineatus*, say, *Plesiocoris rugicollis*, Fall., which has not previously been known from North America, and *Irbisia sericans*, Stål, which was common on rye grass. The last-named is injurious to rye and oats in California.

GARMAN (P.). **A Study of the Bulb Mite** (*Rhizoglyphus hyacinthi*, **Banks.**).—*Connecticut Agric. Expt. Sta., New Haven*, Bull. 225 (Ent. Ser. no. 28), January 1921, pp. 115–132, 3 plates, 3 figs.

Inspection in 1919 revealed the fact that a large percentage of the bulbs imported into Connecticut were infested with *Rhizoglyphus hyacinthi*, Banks (bulb mite). A general description of this mite is given. It is apparently able to subsist on almost any tuber or bulb. Narcissi and lilies offer least resistance to attack, as the scales are loose and the mites easily penetrate to the interior. Tulips are least injured, hyacinths slightly more so ; onions do not seem to be infested unless already partly rotten or bruised. An account is given of the life-history of the mite ; the dimorphic or heteromorphic male is described, and the hypopial form and the causes affecting its production are discussed. Dissemination is chiefly by means of the hypopial stage, which clings to small flies emerging from the decayed bulbs. While the life-cycle may occupy from 9 to 29 days, it may be extended to a month and a half if the hypopial stage develops or adverse conditions prevail.

The Tyroglyphid, *Histiostoma rostroserratus*, is frequently found in company with *R. hyacinthi*, and predaceous mites (LAELAPTINI) doubtless destroy many of the bulb mites. The larvae of a Cecidomyiid, *Lestodiplosis* sp., also feed on them. Various remedial measures tried by different investigators are discussed, and a list is given of treatments with many substances. Dipping the bulbs in nicotine sulphate 1 : 400, or nicotine oleate, heated to 122° F., or even water at the same temperature, is a satisfactory method of killing the mites.

BRITTON (W. E.) & CLINTON (G. P.). **Spray Calendar.**—*Connecticut Agric. Expt. Sta., New Haven*, Bull. 224, 1921, pp. 67–110, numerous figs.

This is a revision of an earlier spray calendar for Connecticut [*R.A.E.*, A, vi, 464].

BLACKMAN (M. W.). **The Spruce Budworm.**—*Maine Forestry Dept., Augusta*, 1919, 10 pp. [Received 16th March 1921.]

Tortrix fumiferana, Clem. (spruce budworm) is considered the most destructive pest of spruce, fir and hemlock in Maine. A heavy infestation of this moth reached its climax in 1878 and 1879, occurring chiefly on the islands and coastal area ; after that date its activities were comparatively unimportant for more than thirty years. Since 1911, however, numerous complaints have been made of its depredations, and at present the outbreak is far more serious than the previous one, for it comprises not only the coast regions, but practically every wooded area of the State, the inland regions being the most

severely attacked. The injury is first shown by a wilted appearance of new growth at the ends of the twigs of spruce and balsam, the needles or leaves of the new spring growth having been gnawed through at the base by the caterpillars. These become full-grown during the first half of June, and pupate in the shelter of the severed needles, which they have webbed together. The moths emerge in the course of a week or two and fly during the last week in June and first half of July, depositing eggs in small masses on the sides of the needles. Oviposition is completed before the end of July, and the larvae, which hatch about a week later, feed for a short time and then hibernate. It is in the following spring that they do the greatest damage. Few trees are killed in the first year of attack, but after a few years they may be entirely defoliated, while bark-beetles and weevils frequently complete the destruction of already weakened trees.

Observations on the extent of injury in various localities are recorded. White spruce seemed to possess some degree of immunity. In balsam fir the larvae of *Monochamus* (*Monohammus*) *scutellatus* were almost invariably found in recently killed trees. Many were also infested by the balsam bark-beetle, *Pityokteines sparsus*, Lec. (*Ips balsameus*, Lec.), and the weevil, *Pissodes dubius*, in the trunk, the smaller limbs and twigs harbouring the small bark-beetle, *Cryphalus balsameus*, Hopk. Nearly all dead and dying spruce had the bark riddled by the spruce bark-beetle, *Polygraphus rufipennis*, Kirby, and many also contained *Dryocoetes affaber*, Mannh. (*piceae*, Hopk.), and in the tops and limbs *Scolytus* (*Eccoptogaster*) *piceae*, Sw. The weevil, *Pissodes nigrae*, Hopk., as well as some of the above-named bark-beetles, frequently hastens the death of weakened trees.

The present infestation by *T. fumiferana* is now decidedly decreasing, and the trees, particularly spruce, are showing great recuperative ability. It is hoped that, as was the case after the previous outbreak, there may be a period of 20 to 40 years of freedom from any serious or widespread injury.

Spraying the trees in spring with 5 lb. lead arsenate to 100 U.S. gals. water is a good remedy, two applications being given with a ten days interval when the buds are just opened, but this is only practicable for ornamental trees. In the woodlands, natural enemies and parasites must be relied upon to overcome the pest. Woodland owners can, however, lessen the danger of loss by proper logging methods. If the stumps are reduced to the minimum, the tops utilised as far as possible, and the slash properly disposed of, there is less opportunity for injurious insects to breed. Trees killed by *T. fumiferana* are by no means valueless, as they will remain sound for several years and can be utilised for pulpwood if they are not riddled by wood-boring insects.

Blackman (M. W.). **The White Pine Weevil, with Methods of Control and Recommendations for a Modified System of Planting White Pine and Norway Spruce.**—*Maine Forestry Dept., Augusta*, 1919, 12 pp. [Received 16th March 1921.]

The southern half of the State of Maine contains large forest tracts in which white pine is the predominating tree, but the majority of these have become crooked, scrubby or bushy, owing in part to the action of pine blister rust, and more particularly to the activities

of the white pine weevil [*Pissodes strobi*], an insect native to the country. The life-history, which is described, is practically identical with that in Quebec [*R. A.E.*, A, vi, p. 62]. The production of the forked or branched top of pines, owing to the feeding of the larvae, is described. While white pine (*Pinus strobus*) is the preferred food-plant, *Pinus banksiana, P. rigida, Picea rubens* and *Picea excelsa* are all occasionally attacked. Young trees from 4 to 20 feet high are the most subject to attack, especially those growing in plantations or open stands.

Remedial measures [*loc. cit.*] are discussed. The author believes that concerted action for several years among all landowners, directed and aided by experts employed by the State, would bring the weevil entirely under control. It is suggested that a system of planting white pine can be devised that will give a large measure of protection to young trees during the period when they are most susceptible to weevil injury. Experimental plots are suggested as a preliminary study for determining the best system.

JACK (R. W.). **The Common Fruit Beetle** (*Pachnoda impressa*, **Gold.**).—*Rhodesia Agric. Jl., Salisbury,* xviii, no. 1, February 1921, pp. 71–75, 2 plates; also *Rhodesia Dept. Agric.,* Bull. 385, February 1921, 7 pp., 2 plates.

Pachnoda impressa, Gold., is a well-known pest of fruit and blossoms throughout South Africa, except in the south-west portions, and is the commonest of several allied species. The beetles emerge from the ground about mid-November and occur throughout the wet season, gradually disappearing before April. Oviposition begins early in January, and continues through the wet season, eggs being laid singly in kraal manure in the settled areas, and in decayed vegetable matter in sheltered situations under natural conditions. The grubs, which hatch after 15 to 18 days, feed on this material from January to June, and then construct pupal cells, in which they rest for a considerable time, pupation occurring about the end of September and lasting from 25 to 28 days. The larval period varies greatly, and in some instances the life-cycle may occupy two years. The pupal cells, made of sand and soil, are found in the ground, sometimes at a depth of 4 to 6 inches. The adults feed upon foliage, blossoms and fruit, their favourite foliage apparently being that of grape vines. Damage has also been observed to roses and other rosaceous flowers, such as late-blooming apples, and to various blossoming trees. The worst damage is done to ripening plums, peaches and apples, which may be quite covered with the beetles.

Enemies of *P. impressa* include ants of the genus *Dorylus,* which break open the pupal cells and devour the larvae; lemurs in captivity eagerly devour the adults.

Poisoned baits for the beetles have been quite unsuccessful. Trees can be protected by mosquito netting, but this is an expensive method. Collecting the beetles by jarring the trees, and the use of an insect net as previously described [*R. A.E.*, A, iv, 395], have proved the best methods of destroying the pest.

Quarantine Proclamations Nos. 76 & 77.—*Commonwealth of Australia Gaz., Melbourne,* no. 16, 24th February 1921.

By the first of these proclamations, both of which are dated 16th February 1921, owing to the existence of pear blight or fire blight

(*Bacillus amylovorus*) in New Zealand, the importation into Australia is prohibited of all plants and parts of plants, including fruit, excepting agricultural seeds and grass seeds, from that Dominion. The second proclamation modifies this into a prohibition against any apple, pear, cherry, apricot, plum, quince or hawthorn tree, or any part thereof, including fruit, grown in any country where *B. amylovorus* exists.

PIERCE (W. D.). **Lectures in Applied Entomology: Vol 1. The General Subject of Applied Economic Entomology**—*Denver, Colorado*, The Mineral, Metal and By-Products Company, 1920–21, 220 pp. multigraph.

This is the first volume of a course of lectures on Applied Entomology. The course is not designed to deal with injurious and beneficial insects in the manner of an ordinary text-book, but rather with methods and principles. The average entomologist has, owing to the vastness of the science, been forced to specialise on only a limited part of economic entomology, and so requires a concise summary of the field before him, in order that he may render the best service.

The first volume of the course comprises ten lectures on such aspects of the subject as the first principles of economic entomology, the qualifications necessary for, and the different branches of, the science, and its relation to organised agriculture and other forms of industry.

PISAR (C. J.). **Use of Insecticides and Fungicides in South Africa.**—*Commerce Repts., Washington, D.C.*, no. 241, 13th October 1920, pp. 199–202. [Received 18th March 1921.]

Statistics are given of the importation into the Union of South Africa during 1919 of sodium arsenite and other insecticides, and of the area under fruit and vegetables. A list is given of the more usual insect pests of fruit trees in South Africa, with their food-plants. The remedies used for each pest are described, and the regulations governing the sale of insecticides in the Province of the Cape of Good Hope are quoted. The terms lead arsenate and sulphur, as used commercially, are defined, with the regulations for the sale of tobacco extract and cyanides.

TICE (C.). **The Potato in British Columbia.**—*B.C. Dept. Agric., Victoria*, Bull. 86, 1921, 75 pp., 78 figs.

In the portion of this bulletin devoted to insect pests of the potato, it is stated that the Colorado potato beetle [*Leptinotarsa decemlineata*], which is established in Idaho and Washington, crossed the boundary into British Columbia in 1919, but was noticed in time and apparently completely exterminated. It would mean a considerable increase of expense, especially to potato-growers in the Dry Belt, where spraying is not at present necessary, if this pest should become generally distributed over the Province; and any suspected insects should be sent at once to the Department of Agriculture for examination. To help identification a brief description of the various stages is given.

Blister-beetles [*Macrobasis unicolor?*] do some damage to potato foliage, and they can be destroyed with arsenical sprays, but as the larvae feed on locust eggs, they are probably beneficial on the whole.

Wireworms are more or less prevalent everywhere, particularly in land that has previously been meadow, and in moist situations.

Badly infested land may sometimes be cleared of them by deep autumn ploughing, followed by plenty of cultivation and by summer fallow in the following year. In this case the land should be kept clear of weeds, to starve the wireworms and prevent the adult beetles laying their eggs. Another method is to plant balls of rice-meal between the rows to act as traps [*R.A.E.*, A, vii, 171, 407].

Other potato pests are the larvae of June beetles [*Lachnosterna*], flea-beetles and cutworms, the usual remedies for which are described.

NEWELL (W.). **On the Organisation of Work in Economic Entomology.** —*Jl. Econ. Ent., Concord, N.H.*, xiv, no. 1, February 1921, pp. 36–48.

The co-operation and co-ordination of all the agencies engaged in economic entomological work is urged. When different agencies work in co-operation, their activities should be regulated by one and the same executive, to prevent duplication of efforts and waste of funds. Suggestions are made for the organisation and working of such a co-operative scheme, and its possibilities are discussed.

FRACKER (S. B.). **A Volunteer Pest Reporting Service.**—*Jl. Econ. Ent., Concord., N.H.*, xiv, no. 1, February 1921, pp. 48–53.

The advantages to be gained by the inauguration of a volunteer pest-reporting service are discussed. A similar service has been tried in Wisconsin, and the method of utilising the information obtained is described. The value of the reports depends on the number and distribution of growers sending the information, its accuracy and the promptness of its despatch. The organisation of such a service on a national scale, with the establishment of permanent records, would facilitate the study of insect losses.

GOSSARD (H. A.) & PARKS (T. H.). **Hessian Fly Prevention.**—*Jl. Econ. Ent., Concord, N.H.*, xiv, no. 1, February 1921, pp. 53–60.

An approaching outbreak of Hessian fly [*Mayetiola destructor*] may be foreseen if a wheat survey by entomologists is undertaken just before harvest. Such surveys have been organised annually since 1917 in Ohio, and with the aid of the observations made at fly-emergence stations in selected localities, it is possible to determine the safest date for sowing wheat to prevent infestation. The response to the late sowing campaign in 1920 was almost unanimous, less than 1 per cent. of wheat being sown before the final dates chosen. Up to 14th October no eggs were found on the young plants, but an unexpected appearance of adult flies during mid-October over all except north-eastern Ohio resulted in an infestation by eggs and larvae of about 20 per cent. of the wheat. In spite of this heavy and belated infestation, the efforts made have been fully justified, and it is estimated that the 1921 crop will be twice as large as it would have been had no attention been paid to the pest.

MARCOVITCH (S.). **The Potato Leaf-hopper and Tarnished Plant Bug in 1916.**—*Jl. Econ. Ent., Concord, N.H.*, xiv, no. 1, February 1921, pp. 61–62, 1 plate.

During 1916 in Minnesota the author reached the same conclusions as those of Ball in 1919 in connection with the potato leaf-hopper,

Empoasca mali, Le B. [*R.A.E.*, A, vii, 278]. During the author's observations two other leaf-hoppers, *Deltocephalus inimicus* and *Cicadula sexnotata,* were found on the plants. The difference of attack by leaf-hoppers and the tarnished plant bug [*Lygus pratensis*] is described.

The hopperdozer was found useless against *E. mali,* which could only be controlled by spraying with 2 to 1 or pure kerosene. The latter did not injure the plants, the reason for which was later determined by Moore [*loc. cit.*, vi, 200].

Hartzell (A.). **Further Notes on the Life-history of the Potato Leaf-hopper** (*Empoasca mali,* **Le Baron).**—*Jl. Econ. Ent., Concord, N.H.*, xiv, no. 1, February 1921, pp. 62–68, fig 1.

In continuing the study of *Empoasca mali,* Le B. (potato leaf-hopper) [*R.A.E.*, A, ix, 31], it has been found that the over-wintering females represent a mixed population, some of them probably being the remnant of the summer generation of the previous year that had emerged too late to complete egg-laying. During the growing season of 1920 one complete and a partial second generation occurred. Field counts indicated about half the number of leaf-hoppers as compared with the previous year. Adults of the summer generation were abundant in the last week in July, but the second brood was insignificant as compared with the first. The development of this generation was probably influenced by the dying of the potato plants during the latter half of August.

The remaining adults migrated to curly dock. Insects in all stages were found on this plant as late as 28th October ; when the food-plant failed, the adults entered into hibernation. Attempts were made to rear a complete generation on Carolina poplar (*Populus alba*), pig-weed (*Chenopodium album*), broad-leaf plantain (*Plantago major*) and curly dock (*Rumex crispus*), but they were only successful on the last-named. This food-plant may serve as a connecting link between the late potatoes in the autumn and early potatoes in the spring.

The insect has also been bred on apple, bean and potato. Nymphs have been collected from Carolina poplar, sumac (*Rhus hirta*), rhubarb, hollyhock and dandelion. The adults probably feed somewhat promiscuously, and may oviposit on plants that are unable to sustain the early stages.

Eyer (J. R.). **The Influence of Leaf-hopper Control on Potato Yields.**—*Jl. Econ. Ent., Concord, N.H.*, xiv, no. 1, February 1921, pp. 69–71.

Experiments made in 1919 indicate that Bordeaux mixture partially reduces hopper-burn and increases the yield by 29 bushels per acre ; Bordeaux-lime (4 : 8 : 50) controlled hopper-burn more effectively, but the yield was 12 bushels less. Extensive experiments were carried out in 1920, in which hopper-burn was reduced to a minimum by the application of Bordeaux 4 : 8 : 50 and nicotine 1 : 800. The average gain, as compared with standard Bordeaux, is about 6 bushels per acre, but in view of the additional cost of the nicotine, the advisability of its use in regions where there is comparatively little sunshine during the growing season is questionable.

FENTON (F. A.). **Progress Report on the Season's Work on the Production of Potato Tipburn.**—*Jl. Econ. Ent., Concord, N.H.*, xiv, no. 1, February 1921, pp. 71–83, 2 figs.

The following are the author's conclusions as given in this paper :—

Tipburn or hopper-burn of the potato is produced through the agency of *Empoasca mali.* All nymphal stages of the leaf-hopper are capable of producing symptoms of the disease. The older the nymphs, the greater the amount of injury done, nymphs in the first and second instars being incapable of producing any effect on the leaf unless in numbers. The greater the number of nymphs on a leaf, the sooner the injury develops and the more rapidly the leaf or plant is killed. The adult hopper is not nearly so effective as any of the nymphal stages, but will produce the disease when concentrated in large numbers on a given plant. The disease is produced to the same extent and just as soon under such diverse environmental conditions as type of soil, amount of moisture in the soil, presence or absence of sunlight, or reduced leaf transpiration. Tipburn as a disease is localised, being confined to that part of the plant exposed to the attack of the leaf-hoppers, whether this be a leaflet or entire branch.

Other insects known to feed on potato, such as nymphs of the buffalo tree-hopper [*Ceresa bubalus*], tarnished plant-bugs [*Lygus pratensis*] Aphids and flea-beetles, produce a type of injury characteristic of the individual species concerned, but in no way resembling tipburn.

Bordeaux mixture prevents tipburn by repelling the ovipositing female leaf-hoppers.

FLINT (W. P.). **Chinch-bug Resistance shown by certain Varieties of Corn.**—*Jl. Econ. Ent., Concord, N.H.*, xiv, no. 1, February 1921, pp. 83–85.

Certain strains of maize show greater resistance to attack by chinch-bugs [*Blissus leucopterus*] than others, but it is apparently impossible to develop a strain that will be sufficiently resistant to the attack of the nearly full-grown insects of the first generation when they leave the wheat fields at harvest time. If the resistant strains are grown on fertile soil and protected from attack by the first brood, moderate yields may be expected. So far "White Democrat" maize shows the greatest resistance, but further tests are to be conducted.

FELT (E. P.). **European Corn Borer in New York State.**—*Jl. Econ. Ent., Concord, N.H.*, xiv, no. 1, February 1921, pp. 85–89.

Observations made in New York State during the past season indicate a continued, though not excessive, spread of the European corn borer [*Pyrausta nubilalis*]. Special attention is being given to improving the method of handling the maize crop in order to anticipate possible serious damage, and quarantine measures are being enforced in co-operation with the Federal Government.

The amount of injury does not necessarily stand in direct relation to the amount of stubble infestation, the direction of the prevailing winds and the proximity of earlier infested fields being important factors in this connection.

McColloch (J. W.). **The Corn Leaf Aphis** (*Aphis maidis*, **Fitch) in Kansas.**—*Jl. Econ. Ent., Concord, N.H.*, xiv, no. 1, February 1921, pp. 89-94, 2 plates.

Aphis maidis, Fitch, is a serious pest of maize and various sorghum crops in Kansas. The Aphids may be found towards the end of June and beginning of July feeding on the tender parts of the leaves, leaving them for the tassel as it develops. Various forms of injury may occur ; the entire tassel may be so heavily infested that it fails to function and the shedding of pollen may be greatly reduced or completely stopped. As a rule the leaves show little injury, but they may become yellow and die. Occasionally the Aphids feed on the silks and soft grains, thus hastening maturity and producing small and poorly filled ears. The honeydew secreted by the Aphids also attracts other maize pests, and there is the possibility that *A. maidis* transmits the physodermal disease of maize. All kinds of sorghum are attacked, but the degree of injury apparently varies. A reddish discoloration, due to bacterial infection, is generally associated with *A. maidis*. The injury to maize increases with delayed planting until about the middle of May. Certain varieties are more injured than others, the degree increasing with the lateness of the variety in the majority of cases. Further studies on these lines are indicated. The Aphids were successfully killed experimentally by spraying with nicotine sulphate, but this method is not applicable to fields of maize or sorghum.

Fluke, Junr. (C. L.). **The Pea Moth in Wisconsin.**—*Jl. Econ. Ent., Concord, N.H.*, xiv, no. 1, February 1921, pp. 94–98.

The annual infestation of pea-pods by *Cydia* (*Laspeyresia*) *novimundi* [*R.A.E.*, A, ix, 100] in Wisconsin amounts to from 2 to 50 per cent. The larvae bore into the pods and feed on the peas, without any external indication of injury. At present this pest is known to attack only field and garden varieties of peas, more especially those grown for seed. Hibernation occurs in the larval stage. The larvae emerge from the pods in the autumn and enter the soil. The first pupae occur about 15th June, the moths emerging from three to four weeks later. During 1920 they were seen in the field up to 28th July. An average of 18 eggs per individual was obtained in the experimental cages. In the field the majority of eggs are found on young pods or leaves. Incubation lasts from seven to nine days, with an average of eight days ; the first eggs hatched 23rd July, the last 11th August. Under insectary conditions the larvae emerged from 6th to 29th August.

No practical method of controlling *C. novimundi* has yet been found, but there is a possibility of checking this pest by a proper rotation of crops. Experiments may also reveal a satisfactory ovicide.

Baerg (W. J.). **A Girdler on Artichoke and other Little-known Insect Pests.**—*Jl. Econ. Ent., Concord, N.H.*, xiv, no. 1, February 1921, pp. 99–100.

The Cerambycid, *Mecas inornata*, Say, oviposits on artichoke (*Helianthus tuberosus*) early in July in Arkansas. Two girdles are made by the adult females, about 1–1¼ inches apart and about 6 inches from the top of the main stem. The egg-puncture is immediately above the lower girdle. As a result of the injury the leader in the plant dies. The larvae feed between the girdles, and later proceed to the base

of the plant, feeding chiefly on the pith. They are full-grown some time in November, and the adults appear early in July. Pupation probably occurs in May or early in June. The common ragweed (*Ambrosia artemisiifolia*) is an alternative food-plant.

In certain localities about 10 per cent. of the foliage of strawberry plants was destroyed by the Arctiid, *Haploa colona* var. *reversa,* Stretch. The larvae appeared early in April and were nearly full-grown by the 19th of the month. The Tenebrionid, *Eleodes tricostata,* Say, causes serious damage in new strawberry beds. The larvae attack the crown and the roots immediately below it. The adults appear late in July.

Section on Apiculture.—*Jl. Econ. Ent., Concord, N.H.,* xiv, no. 1, February 1921, pp. 101–137.

The papers dealing with apicultural problems are: The Value of good Queens, by F. B. Paddock; The Problem of Controlled Fertilisation of Queen Bees, by L. V. France; Further Notes on the Value of Winter Protection for Bees, by J. H. Merrill; Some Bee-keeping Problems for Experiment Stations, by F. C. Pellett; Stopping the Distribution of American Foulbrood at its Source, by S. B. Fracker; Mixed Infection in the Brood Diseases of Bees, by A. P. Sturtevant; and Legislation for Control of Foulbrood, by M. C. Tanquary, containing suggestions for the framing of a State foulbrood law.

Parker (J. R.) & Seamans (H. L.). **Experiments with Grasshopper Baits.**—*Jl. Econ. Ent., Concord, N.H.,* xiv, no. 1, February 1921, pp. 138–141.

As a result of experiments with materials that would possibly prove more effective and cheaper than those now in use for grasshopper baits, lemons appear to be the least attractive of the substances tried. Salt was more attractive than lemons or oranges, and was just as effective alone as with the addition of molasses. The most attractive substance proved to be amyl acetate. It has the additional advantages of being cheap, ready for use, easy of transport, and of keeping indefinitely. The experiments described were conducted against *Camnula pellucida,* Scudd. Since the writing of this paper, amyl acetate has been successfully tried on a large scale.

Sanders (J. G.). **Imported Pine Sawfly.**—*Jl. Econ. Ent., Concord, N.H.,* xiv, no. 1, February 1921, p. 141.

Diprion simile is recorded from Harrisburg, Pennsylvania.

Morrill (A. W.). **The Thurberia or Wild Cotton Boll Weevil.**—*Jl. Econ. Ent., Concord, N.H.,* xiv, no. 1, February 1921, p. 141.

Anthonomus grandis var. *thurberiae,* Pierce, is recorded from the cotton fields in Arizona. Though this weevil has previously been noted on experimental cotton and as a potential cotton pest [*R.A.E.,* A, ii, 78, 272, etc.], it has not previously been recorded as attacking this crop when grown commercially.

FROGGATT (W. W.). **Orchard and Garden Mites. No. 2.–Spinning Mites (Family Tetranychidae).**—*Agric. Gaz. N.S.W., Sydney,* xxxii, no. 2, February 1921, pp. 130–135, 3 figs.

This article mentions several species of Tetranychids found in various parts of the world and gives a short account of *Tetranychus telarius,* L. (red spider), and *Bryobia pratensis,* Garm. (apple-stem mite). In consequence of the long dry spring, the roses in suburban gardens near Sydney were considerably injured by *T. telarius* in 1920. On the stems of fruit trees in winter, the eggs and young mites can be destroyed with lime-sulphur, and as this is a winter spray largely used by commercial orchardists, this pest does not cause them very much trouble. Dusting the infested foliage with flowers of sulphur is effective on rose bushes and other small garden plants.

DAVIDSON (W. M.). U.S. Bur. Ent. **Observations on** *Psyllobora taedata,* **Le Conte, a Coccinellid attacking Mildews (Col.).**—*Ent. News, Philadelphia, Pa.,* xxxii, no. 3, March 1921, pp. 83–89.

Psyllobora taedata, a common Coccinellid in California, is found to be associated in all stages with fungous infestations of the mildew type, and it appears to be especially attracted to rose and apple powdery mildew (*Sphaerotheca pannosa* and *Podosphaera oxycanthae*). The adult beetles issue from hibernation in April, and breeding continues until November or even December. In midsummer the life-cycle lasts about a month, but varies very much according to the temperature, so that there are probably not more than five generations a year. In the field the eggs are always placed near a fungus infestation, and all through their larval existence the insects under observation fed on the fungi. On an average, the larval stage lasts about 19 days. *P. taedata* has been reported as feeding on Aphids, red spiders (*Tetranychus*) and scale-insects, but experimentally the larvae were found to starve rather than partake of such animal foods. Similar results were obtained with adult beetles, except that they can live for considerable periods without food. The author suggests that the peculiar form of the mandibles in this beetle may be an adaptation to assist the larvae to grasp the tissues of the fungus.

COURTINE (E.). **A Propos des Vers Blancs dits à Hanneton.** [Concerning White Grubs said to be of Cockchafers.]—*Rev. Agric. Afrique du Nord, Algiers,* xix, no. 84, 11th March 1921, pp. 198–199.

A serious outbreak of Coleopterous larvae, thought to be those of *Rhizotrogus* sp., over a large area sown with cereals is recorded.

On a former occasion, in 1910, the grubs caused serious damage in the year preceding their metamorphosis into adults, without anything being done to check them, but in the following year, when the adults began to emerge from the ground, hand-collection was tried and some 40 to 60 lb. of the beetles were collected each evening, without apparently diminishing their numbers to any great extent. A spray of $\frac{1}{4}$ lb. sodium arsenite to 20 gals. of water was then applied to some 125 acres of cereals, hand-collection being stopped. After two or three days no more beetles appeared, and the land treated has now been free from white grubs for ten years.

THOMAS (G.). **La Fourmi d'Argentine.** [The Argentine Ant.]—*Jl. d'Agric. Pratique, Paris,* xxxv, no. 11, 19th March 1921, pp. 211–213.

As a consequence of the appearance of *Iridomyrmex humilis* (Argentine ant) in the south of France [*R. A.E.*, A, viii, 326; ix, 56], a study has been made of the arsenicals that may be used against this pest within the scope of the decree of September 1916 [*R. A.E.*, A, v, 47]. It is suggested that a mixture should be obtained containing 3 grammes of sodium arsenate, 30 grammes of talc and 0·5 gramme of colouring matter. A mixture consisting of 1,000 grammes of brown sugar, 500 grammes of water and 1 gramme of sodium benzoate should then be boiled slowly for half an hour, adding water to maintain the original volume of liquid. The above mixture is then thoroughly mixed in.

A project brought forward by the prefect of the Maritime Alps is given verbatim, the use of poison baits having been recognised as legal for the purpose in question. In accordance with this project, ants are to be destroyed in nurseries and buildings by the owners or persons using them, and inspection of premises is to be allowed. The methods to be adopted are poison baits, where their use is authorised; the use of repellents; winter treatments, consisting of shelter traps containing decomposing matter and subsequent destruction of the ants with carbon bisulphide; and disinfection of pots from infested nurseries containing plants for sale.

DUFRÉNOY (J.). **Les Entomophytes d'*Anomala aenea*.** [Entomophytic Fungi of *Anomala aenea*.]—*Rev. Zool. Agric. & Appl., Bordeaux,* xx, no. 1–2, January–February 1921, pp. 12–13, 1 fig.

During an infestation of the small cockchafer, *Anomala aenea*, on nut-trees and birches, of which the lower leaves were badly riddled, it was found that in one locality the beetles were being rapidly destroyed by a fungus; this practically cleared the trees by 14th July, while in a neighbouring locality, where it did not occur, the cockchafers persisted until the end of July. The history of the fungus accords with that of the species of *Beauveria* studied by Picard, but the character of the disease produced in the insects resembles that caused by *Verticillium* sp. The fungus has not yet been cultivated, and attempts to produce an infection in *Chrysomela gloriosa* gave doubtful results.

FEYTAUD (J.). **Traitement d'Hiver contre les Cochenilles de la Vigne.**—*Rev. Zool. Agric. & Appl., Bordeaux,* xx, no. 1–2, January–February 1921, pp. 13–14.

Among the principal Coccid pests of vines in France [*R. A.E.*, A, iv, 492] is *Eulecanium* (*Lecanium*) *persicae* (oblong scale), which is very widespread in the south-west. The signs of its presence are the empty skins of the females frequently left fixed to the bark, the sooty mould that often covers the branches, and the young scales that may be found under the leaves in summer and on the branches in winter. Although there is only one generation a year, multiplication is very rapid. One of the most effective treatments is whitewashing the trunk and branches with a mixture of 5 lb. heavy tar-oil and 20 lb. stone lime to 10 gals. of water. The method is to pour a little water on the lime, and then pour on the oil, which is gradually absorbed if occasionally

stirred with a stick. This mixture is then added to the rest of the water. The whitewashing is done in winter, after pruning, special attention being given to the current year's growth and to the lower side of the stems.

Baer (W.). **Die Tachinen als Schmarotzer der schädlichen Insekten. Ihre Lebensweise, wirtschaftliche Bedeutung und systematische Kennzeichnung.** [Tachinids as Parasites of Injurious Insects. Their Life-history, Economic Importance and Systematic Characters.]—*Zeitschr. angew. Ent., Berlin,* vii, nos. 1 & 2, September 1920 and February 1921, pp. 97–163 and 349–423, 30 figs.

The general section of this paper has already been noticed [*R. A.E.*, A, ix, 61]; the present part is an attempt to meet a growing demand for a key to the Central European Tachinidae and for a systematic work on these flies that would also be suitable for a non-specialist.

After discussing the morphology of these flies, a systematic review of the subfamilies is given, followed by a key to the Central European genera.

The various genera of Tachinidae are listed, specific keys being included where required. Brief notes are given regarding each species, its occurrence, and its hosts. A systematic list of the hosts, with their Tachinid parasites, follows.

Wille (J.). **Chlorpikrin in der Schädlingsbekämpfung, insbesondere im Kampf gegen den Kornkäfer** (*Calandra granaria,* **L.**). [Chloropicrin against Pests, especially *C. granaria.*]—*Zeitschr. angew. Ent., Berlin,* vii, no. 2, February 1921, pp. 296–310.

As a result of a series of experiments chloropicrin (CCl_3NO_2) is recommended against *Calandra granaria,* L., which is killed in six hours if a strength of 30 c.c. of the liquid per cubic metre of space is used. When the weevils are in heaps or bags of grain, 40 c.c. must be allowed to act for 24 hours if the destruction of all stages is to be absolutely ensured. As slight traces of this substance irritate the eye, nose and respiratory organs, the operators should be protected by an ordinary gas mask with a special respirator of large capacity. The germinating quality of fumigated grain is reduced about 30 per cent., but this is not a drawback in practice, because infested grain is seldom used as seed. The baking quality of the grain and flour is not affected. Feeding experiments with mice and rabbits showed that treated corn can be used with impunity. Metals are acted upon by chloropicrin in the presence of aqueous vapour; in the absence of humidity they remain unchanged. Fabrics and colours do not suffer in any way. The fumes disappear in about six hours, so that large buildings may be expected to be habitable in 24 hours at the outside.

In the case of other insect pests, the cockroaches, *Blattella* (*Phyllodromia*) *germanica, Blatta* (*Periplaneta*) *orientalis* and *B.* (*P.*) *americana,* were killed in two hours, 10 c.c. per cubic metre being used. The various stages of the flour beetle, *Tenebrio molitor,* were more resistant, especially the pupae, six hours at 20 c.c. being necessary. The meal moth, *Ephestia kühniella,* succumbed to an exposure of four hours, 30 c.c. being used. The bed-bug, *Cimex lectularius,* was more resistant by comparison; adults and larvae were killed in six hours with 20 c.c., but 30 c.c. acting for two hours failed to destroy individuals inside rolled-up carpets. Compared with hydrocyanic acid gas, chloropicrin is slow in penetrating obstacles to diffusion and is more readily absorbed by fabrics.

Rebel (—). **Nonnenvermehrung im Hofoldinger Forst 1899–1902.** [An Outbreak of the Nun Moth in the Hofoldinger Forest in 1899–1902.]—*Zeitschr. angew. Ent., Berlin,* vii, no. 2, February 1921, pp. 311–333.

The details of the outbreak of the nun moth [*Liparis monacha*] here described were officially reported at the time, but have not hitherto been made public.

The best method of ascertaining the extent of infestation is by means of caterpillar counts. One method consists in banding a group of trees (covering 120–240 square yards) in all older stands, and collecting the caterpillars below the bands on each second day, their number, the weather, and parasitism by Tachinids being noted. In another method two similarly banded plots, each of 120 square yards, are isolated by sticky barriers (smeared poles laid on the ground), and the caterpillars on the ground and on the trunks beneath the bands are collected daily. The living soil covering is removed and the trunks numbered, the daily catches and the Tachinid parasitism being recorded. This method is the more accurate, and is preferable in every way. At the end of the season the trees were climbed and the caterpillars still remaining on the branches collected. In the Hofoldinger forest 1 per cent. of the area was examined. This is quite unnecessary, and in the case of fairly extensive areas of a uniform character the second method only requires to be applied to $\frac{1}{2000}$ of the area involved.

Moth collection, even in the most favourable circumstances, only accounts for 10–13 per cent. of the individuals capable of injury. Heavy rain, especially when nocturnal, combined with a low temperature, destroys large numbers of them.

Great attention must be paid to natural enemies, and if they are likely to be present in insufficient numbers, banding must be applied in the very first year of the outbreak.

A large number of apparently healthy caterpillars and pupae were placed in extemporised cages. The result was surprising, for 88 per cent. failed to develop. Of these, 13 per cent. were shrivelled or otherwise destroyed; 5 per cent. were infested by *Ichneumon disparis* and *Trogus flavatorius*; 30 per cent. by the Tachinid, *Parasetigena segregata*; and 40 per cent. were infested by what was probably *Sarcophaga pabulans*, Fall., which is a pupal parasite. Some larvae of *Anthomyia processioneae* (?) were seen, and *Pimpla* spp. destroyed some pupae.

Sedlaczek (—). **Fangbaummethoden für die verschiedenen Borkenkäferarten.** [Tree-traps suitable for the various Species of Bark-beetles.]—*Zeitschr. angew. Ent., Berlin,* vii, no. 2, February 1921, pp. 334–339.

The subject of the attractiveness of withering timber to bark-beetles still requires a great deal of study. This paper only aims at recording characteristic observations as a guide to any measures contemplated against the more important species.

Lack of sap is due to a variety of causes, and soon shows itself in a fallen tree. In such cases, and especially after a summer drought or in a windbreak, the following bark-beetles, all of which like dry surroundings, are to be found: *Ips* (*Tomicus*) *typographus* and *I.* (*T.*) *chalcographus* in spruce; *I.* (*T.*) *curvidens* and *I.* (*T.*) *vorontzowi* in

fir, *Pityophthorus* spp. occurring in the branches ; *I.* (*T.*) *bidentatus* and *Pityogenes* spp. in the branches of pine, with *I.* (*T.*) *sexdentatus* in the trunk.

A blocking of the sap-flow, which results in decomposition, occurs after defoliation, which may be due to insect infestation. Injury to the crown, as is seen in stumps standing in windbreaks, is also responsible for this condition, and it occurs in trunks that have been felled and deprived of their branches in early spring. Such damp timber attracts the following beetles :—*Hylesinus palliatus* and *Ips* (*Tomicus*) *autographus* in spruce ; *Cryphalus piceae* in fir ; *Myelophilus* spp., *Hylastes* spp., and *Hylesinus palliatus* in pine. *I.* (*T.*) *lineatus* appears in spruce and fir if the wood is damp enough to ensure the formation of the fungus layer in the mines.

The preparation of trap-trees must be carried out on this basis. For standing trap-trees, two rings are cut round the trunk, with a space of a hand's-breadth between them. The bark between the rings may be left (double ringing), or it may be removed (girdling) ; the crown of the tree may be sawn off, or the branches may be lopped off. In spite of the high attractiveness of standing trap-trees, they are not often used, because their preparation is troublesome, the attack and development of the beetles are difficult to observe, and, especially, because a period of from one to two years elapses before attractiveness begins. For practical work felled trunks are used as traps. Their attractiveness may be increased materially by scarifying their upper surfaces longitudinally, the resulting resinous odour attracting species such as *Hylastes, Pissodes* and *Hylobius*. In such a scarified trunk the brood often fails to develop because the bark soon dries and large numbers of parasitic and predaceous enemies appear.

The position of the tree and the character of its surroundings are important factors in the selection of a trap-tree. The season of the year must also be considered. Trees felled in winter usually become attractive in the following flight period, whereas trees felled in spring or early summer are rarely ready in the same year, and by the next season are already too much decomposed to prove attractive.

The following data apply to a region with an average annual temperature of 42°–46°F., where felling is done in winter, where girdling standing trees is not much practised, and where beetles occur in normal abundance.

Spruce. *Hylastes cunicularius* : Double rings a few months before felling, removal of strips of bark after felling, examination of the side touching the ground after a few months ; in sheltered positions the branches must be lopped off ; in exposed ones they must be left. *H. palliatus* : Felled trunks with branches in exposed situations and lopped in protected places ; standing trunks without crowns or entirely lopped. *Polygraphus poligraphus* : Girdled trees to be felled in spring, the branches being left and strips of bark removed ; standing trunks to be girdled or double-ringed ; these require a long time to become attractive, but then become very effective. *Ips* (*T.*) *chalcographus* : Faggot-wood or billets are best ; felled trunks must be lopped except in shaded situations ; standing trees must be girdled or double-ringed. *I.* (*T.*) *amitinus* : Felled trunks with branches ; standing trees to be double-ringed. *I.* (*T.*) *typographus* : Trees, preferably girdled in the previous autumn, must be felled in winter or early spring, ungirdled ones must be scarified ; in exposed situations they must be

lopped; standing trees must be girdled. *I.* (*T.*) *lineatus*: Felled trunks must be lopped, the bark being left entire; the branches or the crowns of standing trees must be removed.

Fir. *Cryphalus piceae*: Felled trunks must be lopped; standing trees must be girdled. *I.* (*T.*) *curvidens*: The branches of felled trunks must be left only in very exposed situations—trap-trunks are seldom of use in sheltered positions; standing trees in exposed situations must be double-ringed.

Pine. *Hylastes ater*: Felled trunks in protected places, with strips of bark removed—especially on the lower side. *H. palliatus*: Felled, lopped trunks in protected situations; standing trees without crowns or lopped. *Hylesinus piniperda*: Felled trunks must be lopped; standing trunks must be girdled or double-ringed, but are effective only beneath the rings, which must therefore be placed as high as possible. *H. minor*: Felled, lopped trunks; standing trees must be girdled or double-ringed and the crowns must be removed—the infestation of standing trunks is uncertain and tardy. *Ips* (*T.*) *sexdentatus*: Felled trunks, lopped in protected situations, and with branches in exposed ones. *I.* (*T.*) *proximus*: Felled trunks, lopped in exposed situations, and with branches in protected ones; double-ringing and scarification is advisable, because every help to rapid drying—except direct sunshine—is valuable; felled trunks are more readily infested than standing ones; the latter must be double-ringed or have their crowns removed. *I.* (*T.*) *lineatus*: Same treatment of the traps as in the case of spruce.

NAGEL (W.). **Bekämpfung von** *Anobium striatum*, **Oliv., mittels Cyanwasserstoffgasen.** [Combating *A. striatum* by means of Hydrocyanic Acid Gas.]—*Zeitschr. angew. Ent., Berlin,* vii, no. 2, February 1921, pp. 340–348.

The Anobiid beetle, *Anobium striatum,* Oliv., is one of the most dangerous pests of timber. The adults mate when the weather turns warm, and the eggs are laid in wood in cracks or in old bore-holes. A few weeks later the larvae begin to do damage, and this continues through the summer. After hibernating, they begin feeding again in spring and pupate in early summer. The beetles emerge a fortnight later.

The remedial measures hitherto tried have failed owing to the inability of the substances used to penetrate wood. Nor is the use of hydrocyanic acid gas as practised in flour mills more successful, because only a minimum amount of gas is able to penetrate. Satisfactory results have been attained by placing infested articles in a vacuum chamber, exhausting the air until a reading of 47 cm. was reached, and then pumping in the gas until the vacuum decreased to 45–45·5 cm. It was found that a strength of 3–4 volumes of HCN. per 100 of space killed all stages with a minimum exposure of 24 hours. Treated articles must then be left for some hours in an open room or, better still, the traces of poisonous gas may be extracted in the vacuum chamber.

The various experiments are described; one of these proved that a vacuum, by itself, is not harmful to the larvae.

Lindinger (L.) **Tätigkeitsbericht der Schädlingsabteilung des Instituts für angewandte Botanik zu Hamburg für die Zeit vom 14 Februar bis zum 30 Juni 1920.** [Report of the Pest Division of the Hamburg Institute for Applied Botany for the Period 14th February–30th June 1920.]—*Zeitschr. angew. Ent., Berlin,* vii, no. 2, February 1921, pp. 424–440.

One section of this report deals with the original habitat of, and measures against, the vine louse [*Phylloxera vastatrix*]. The author is of opinion that there is no evidence to justify the popular idea that North America is the original home of this pest. The home of *Vitis vinifera* is known to some extent, but little information is available regarding the pests of wild vines. The author has investigated the Coccids found on *Vitis vinifera* cultivated in the Old World, as regards their country of origin and their infestation of other plants. Of these, the only one that seems to throw any light on the question is *Targionia vitis,* which occurs on *Arbutus, Quercus* and *Vitis.* In connection with the oak-infesting species of *Phylloxera* the author is inclined to connect the home of both *P. vastatrix* and the vine with that of the European-Mediterranean species of *Quercus.* The occurrence of *T. vitis* on *Arbutus* indicates the south of this region. The vine grows wild on the shores of the Black Sea, and the author believes that region to be the original habitat of *P. vastatrix.* He thinks that *P. vastatrix* and the species infesting oak belong to the same genus. The fact that *P. vastatrix* has been found on the vine only does not prevent it from being a migratory species, in the development of which a species of *Quercus* plays a rôle. Consideration of the Coccid fauna tends to support this view, and it is highly desirable that the pests of wild vines and of plants allied to them should be ascertained in various places. One such locality is the Bulgarian forest called Deliorman, on the Rustchuk-Schumen line.

Attention is also drawn to the fact that the distribution of *Phylloxera* in the Caucasus points to its probable place of origin being in that region, where the increasing clearing of forests and laying-out of vineyards brings the vine nearer to the forests and increases the possibility of infestation.

The section dealing with remedial measures refers solely to the use of American stocks. These are preferred on account of their vigorous growth and greater immunity. In recent years, however, cases of severe infestation have occurred on them. The author believes the less vigorous growth of cultivated vines to be due to artificial propagation during thousands of years. Sufficient attention has not been given to the fact that on certain soils—such as some Hungarian sandy soils—*Vitis vinifera* remains uninfested. This is not to be ascribed to any chemical property of the soil, but simply to the fact that the roots are able to go down to a considerable depth. Like all Rhynchota, *P. vastatrix* requires a certain amount of air, and therefore lives near the surface. If the roots are able to reach a safe depth before sustaining severe injury, they are able to escape the parasite higher up by developing a stout bark. If a subsoil layer of slate, etc., is present, the roots are forced to spread out near the surface, and the vine is helpless against infestation. The author agrees with the observations of Popoff and Joakimoff [*R.A.E.*, A, v, 533], though he advises that vines should be trained in an horizontal direction at not too great a height.

Escherich (K.). **Angewandte Entomologie und Phytopathologie.** [Applied Entomology and Phytopathology.]—*Zeitschr. angew. Ent., Berlin,* vii, no. 2, February 1921, pp. 441–447.

The author expresses his agreement with the views stated in a paper by Dr. L. O. Howard [*R.A.E.*, A, iii, 353], and explains his reasons for claiming an independent and authoritative position for applied entomology. Some of these have already been noticed [*R.A.E.*, A, ix, 158].

Reh (L.). **Die Ausbildung der praktischen Zoologen.** [The Training of Applied Zoologists.]—*Zeitschr. angew. Ent., Berlin,* vii, no. 2, February 1921, pp. 447–450.

Except as regards forestry, the official scientific plant protection service in Germany has been directed by botanists and, sometimes, by chemists ; zoologists have only held subordinate positions. The view here expressed is that botanists, even applied botanists, have no claim whatever to be consulted as regards the training of the applied zoologist. The latter needs a thorough knowledge of zoology, especially entomology in all its aspects, and such a knowledge absolutely outweighs a preliminary knowledge of botany and agriculture, though the latter subjects are naturally desirable. The ideal training would comprise a thorough knowledge of zoology, then chemistry and botany. During or after these studies, lectures on applied zoology and agriculture in general should be taken at an agricultural college. This should be followed by a summer's practical work on a large agricultural or horticultural estate.

Escherich (K.). **Der Pflanzenschutz an den Münchener Hochschulen.** [Plant Protection at the Munich High Schools.]—*Zeitschr. angew. Ent., Berlin,* vii, no. 2, February 1921, pp. 450–452.

The methods of teaching applied zoology followed at the University and Technical College at Munich are briefly described. The lectures on forest entomology lay stress on the relation between forestry, soil, climate, etc., and the occurrence of pests, attention being given to natural enemies. The lectures are supplemented by practical work, including identification of insects and excursions into forests.

Since 1917, lectures on the animal pests of agriculture have been given, and recently the training on agricultural plant protection has been made similar to that already existing for forest protection.

Heymons (R.). **Heuschrecken der Gattung** *Leptophyes* **und ihre Schädigungen an Pfirsichblättern.** [Grasshoppers of the Genus *Leptophyes* and their Injury to Peach Leaves.]—*Zeitschr. angew. Ent., Berlin,* vii, no. 2, February 1921, pp. 453–456.

In recent years several cases of injury to peach foliage by *Leptophyes punctatissima*, Bosc., have occurred in North Germany. This Orthopteron has been frequently recorded in South Germany, whence it has apparently been introduced into the north. As only an imperfect description is available, the species is redescribed.

L. punctatissima was found in July, August and September, the younger larval stages having escaped notice at the beginning of

summer. Feeding usually took place at twilight or night. The attack begins at the edges of the leaf and extends up to or close to the midrib. Three or four leaves are thus injured in a few minutes. Owing to the comparatively small number of individuals present, the damage was negligible. In England peaches, apricots and plums have been occasionally injured to some extent. Should the infestation become serious, a spray of Urania green should be applied after the fruits have been gathered.

HORST (A.). *Agriotes obscurus* **als landwirtschaftlich wichtiger Schädling. (Vorläufige Mitteilung.)** [*A. obscurus* as an agriculturally important Pest. Preliminary Communication.]—*Zeitschr. angew. Ent., Berlin,* vii, no. 2, February 1921, pp. 456–457.

Large areas of the Prussian Crown Domain of Köpernitz have been severely infested by wireworms. As a result of breeding experiments, the pests were identified as *Agriotes obscurus* and *Corymbites aeneus,* and not *A. lineatus* as might have been expected. A full report on the outbreak will be published later.

v. LENGERKEN (H.). **Die Tätigkeit der Larve von** *Balaninus glandium,* **Mrsh., und ihre Wirkung.** [The Feeding Activity of the Larva of *B. glandium* and its Effect.]—*Zeitschr. angew. Ent., Berlin,* vii, no. 2, February 1921, pp. 461–462.

Although *Balaninus glandium,* Mrsh., is scarcely of economic importance, it may be of interest to record the fact that the larvae of this weevil do not appear capable of interfering with the vitality of acorns infested by them.

v. LENGERKEN (H.). *Carabus auratus,* **L., und seine Larve.** [*C. auratus* and its Larva.]—*Zeitschr. angew. Ent., Berlin,* vii, no. 2, February 1921, pp. 462–463.

Carabus auratus, L., may be regarded as a beneficial beetle. In summer it feeds on large quantities of the larvae and imagines of insect pests such as *Phyllopertha horticola,* L., *Blitophaga opaca,* L., *B. undata,* Müll., the caterpillars of *Agrotis* spp., *Melolontha melolontha,* L., *Rhizotrogus aestivus,* etc.

RUSCHKA (F.). **Zur Morphologie und Systematik des Kornkäfer Chalcidiers,** *Lariophagus distinguendus,* **Först.** [Notes on the Morphology and Systematic Position of the Grain-beetle Chalcid, *L. distinguendus.*]—*Zeitschr. angew. Ent., Berlin,* vii, no. 2, February 1921, pp. 463–465.

Hase's investigations on the biology of *Lariophagus distinguendus,* Först. [*R.A.E.,* A, ix, 133] render it necessary to record the synonymy of this Chalcid and to give a description of it. A list of 15 synonyms, with notes on them, is given.

L. distinguendus is known to parasitise *Calandra* (*Sitophilus*) *granaria,* L., *C. oryzae,* L., and *Sitodrepa* (*Anobium*) *panicea,* L. Its area of distribution, like that of its hosts, must embrace the whole world.

Börner (C.) & Thiem (—). **Neuere Versuche zur Reblausbekämpfung.** [Recent Experiments in combating *Phylloxera*.]—*Zeitschr. angew. Ent., Berlin,* vii, no. 2, February 1921, pp. 465–466.

The spread of the vine louse [*Phylloxera vastatrix*] in valuable vineyards on the Rhine has led the Prussian and Hessian governments to make further experiments in perfecting remedial measures. The Imperial Biological Institute is examining these and will report later.

Aussprache über die Bekämpfung tierischer Rebschädlinge. [A Discussion on Measures against Animal Pests of the Vine.]—*Zeitschr. angew. Ent., Berlin,* vii, no. 2, February 1921, pp. 466–471.

In a discussion on the action of a number of insecticides on vine pests it was pointed out that Urania green can be used without any risk of scorching if it is combined with a lime-copper spray. The mixture is best prepared as follows :—To obtain 50 gals. of solution, 12 oz. Urania green and about 20 lb. slaked lime are put in a container with enough water to produce a uniform fluid paste. About 25 gals. water are then gradually added and well stirred in. A solution of 10 lb. copper sulphate in 25 gals. water is then added very slowly, stirring being continued. The completed spray must turn phenolphthalin red, otherwise more lime must be added. The Urania green does not separate out in this mixture, which is excellent in every way.

Lessard (E.). **Insectes nuisibles des Forêts : La Vanesse de l'Orme** (*Vanessa antiopa,* **Lin.).**—*Nat. Canad., Quebec,* xlvii, no. 8, February 1921, pp. 169–174.

Vanessa antiopa is found from May to September, mainly on elms, though it also attacks willow and poplar. The eggs have been observed on the canoe birch (*Betula papyrifera*) and on white birch (*B. populifolia*), but they are usually found on the branches and underside of the leaves of elm.

As the larvae tend to be gregarious, infested branches can be cut out and burnt. They are also easily shaken from the tree, or the torch method can be employed. Arsenical sprays and the use of sticky bands are recommended.

Mitchener (A. V.). **The Western Wheat-stem Saw-fly.**—*Manitoba Agric. Coll., Winnipeg,* Circ. 57, August 1920, 3 pp., 2 figs. [Received 29th March 1921.]

A brief account of *Cephus occidentalis* (western wheat-stem saw-fly) and its control is given [*R.A.E.*, A, iii, 630 ; v, 265]. The damage in Manitoba is chiefly confined to wheat. By actual count in one field in August 1920 as many as 55 per cent. of the wheat-stems were affected.

Mitchener (A. V.). **Poisoning Grasshoppers.**—*Manitoba Agric. Coll., Winnipeg,* Circ. 59, February 1921, 4 pp., 3 figs.

The illustrated description of the Manitoba poison mixer shows it to be a horizontal drum in which the mixing is done by rotating stirring rods, a catch preventing the drum from revolving. By releasing the catch, the drum can be turned so as to discharge its contents.

Formulae for poison baits are given ; one that gave very gratifying results in 1920 consists of bran 50 lb., sawdust in bulk equal to the bran, white arsenic or Paris green 5 lb., salt 5 lb., and water 12 gals. (approximately).

Mixing and spreading methods are described.

Newman (L. J.). **Descriptive Account of the Fruit-fly.**—*Western Australia Dept. Agric., Perth,* Bull. 48, 1916, 36 pp., numerous figs. [Received 29th March 1921.]

The life-history of, injury done by, and remedies against, *Ceratitis capitata* are clearly described. As regards poison-baits, it was found after many experiments that the odour of orange juice or essence is the agent most attractive to the female fly. The formula is as follows :—The juice of 1 doz. average-sized ripe oranges, 4 lb. molasses, 4–5 oz. lead arsenate paste (or 2–2½ oz. powdered lead arsenate) and sufficient water to make up 4 gals. Other citrus fruits may be used when oranges are not obtainable.

Newman (L. J.). **Potato Insect Pests.**—*Western Australia Dept. Agric., Perth,* Bull. 72, 1920, pp. 7–27, 15 figs. [Received 29th March 1921.]

The pests dealt with are *Phthorimaea operculella* (potato moth), the green potato aphis, *Nysius vinitor* (Rutherglen bug), cutworms and looper caterpillars, and *Heterodera radicicola* (potato eelworm), the injury done by them being described.

In Western Australia *P. operculella* attacks potato, egg-plant, tomato, Cape gooseberry, tobacco, *Solanum sodomaeum* (apple of Sodom), and occasionally *S. nigrum* (nightshade). The last two are becoming increasingly important food-plants of this moth, and should be eradicated. *P. operculella* enjoys comparative freedom from natural enemies, and so far no internal parasite of it has been found. The life-cycle extends under laboratory conditions from 41–62 days in summer to 92–125 in winter. These results render possible the occurrence of three or four generations in summer, and two in winter, though under field conditions the number may be less. The equable and mild climate of Western Australia accounts for this metamorphosis being more rapid than that usually attributed to *P. operculella.* Fumigation as a means of destroying all stages in stored tubers, has proved entirely satisfactory. Either hydrocyanic acid gas or carbon bisulphide is effective, but the latter is recommended on account of its practical advantages. Complete farm sanitation and co-operative action are essential if this pest is to be checked.

Green potato aphis yields readily to kerosene emulsion, tobacco wash, resin and soda, Blackleaf 40, and other contact insecticides. *Nysius vinitor* may be combated with any of the above contact sprays, but the best results are obtained with preventive means, including farm sanitation, trap-heaps, etc. *Heterodera radicicola* is extremely difficult to eradicate when established. Remedial measures include crop rotation, dressing with quicklime, the use of Kainit and potassium sulphate manures, beetroot trap-crops, etc.

Work connected with Insect and Fungous Pests and their Control.—*Rept. Agric. Dept., Dominica, 1919–20, Barbados,* 1920, p. 19.

An outbreak of *Orthezia insignis* on lime trees in certain districts of Dominica was the only occurrence of importance during the year. This Coccid is generally distributed in the island, but has not often been reported in serious abundance. In the outbreak in question the limes were growing in exhausted hillside soil, and consequently, though spraying might do some good, it would only divert attention from what is really needed—the improvement of the soil conditions, and perhaps also protection from wind.

In a case where the hurricanes of 1915 and 1916 had destroyed a wind-break, lime trees had suffered severely from the wind, and the trees had been attacked by *Chionaspis citri* and *Lepidosaphes beckii*. The latter scale had, however, been completely overcome by the red-headed fungus (*Sphaerostilbe coccophila*).

Food-plants of the Pink Bollworm.—*Agric. News, Barbados,* xx, no. 491, 19th February 1921, p. 58.

The pink bollworm [*Platyedra gossypiella*], which was found in Montserrat a few months ago, has been recorded as feeding on okra [*Hibiscus esculentus*]. As it also feeds on Indian hemp (*H. cannabinus*), and as all Malvaceous plants that produce seeds large enough seem attractive to it, they should be included in the schedule of cotton destruction planned by the Government for Montserrat [*R.A.E.*, A, ix, 99].

Williams (C. B.). **Report on the Froghopper Blight of Sugar-cane in Trinidad.**—*Mem. Dept. Agric. Trinidad & Tobago, Trinidad,* no. 1, January 1921, 170 pp., 11 plates, 32 figs.

Sugar-cane in Trinidad is cultivated over some 78 square miles, and for many years has been considerably damaged by outbreaks of froghopper blight, which consists of browning and drying-up of the leaves and a consequent check to the growth of the plant. *Tomaspis saccharina* (sugar-cane froghopper) is almost invariably abundant in blighted fields, as well as various root fungi, and both have been held responsible in varying degrees for the damage. The injury usually appears about six weeks to two months after the wet season begins; the canes stop growing, and the leaves wilt and are streaked with brown marks. They show some recovery after a few weeks, but are frequently subject to a second, and perhaps a third, attack at intervals of about two months. The nature of the blight and its connection with *T. saccharina* are discussed. Each puncture of the froghopper on a leaf causes an injury that spreads; the roots are damaged by the sucking of the nymphs, by the root fungi usually associated with the blight, and by the unfavourable soil conditions nearly always found in fields liable to attack, and injury to other parts of the cane occurs as a natural consequence. The greatest intensity of the blight is about two to three weeks after the maximum abundance of froghoppers, but the total damage varies greatly from year to year and from place to place.

The various froghoppers occurring in other countries are enumerated. *T. saccharina* is only known from Trinidad, Grenada and possibly St. Vincent; it is almost certainly native to Trinidad. Feeding on the

leaves occurs from dusk to early morning, when the adults retire to the shelter of the axils of the leaves. From 40 to 100 eggs are laid by each female, either in decaying leaf-sheaths near the ground or in the soil. The egg-stage lasts from two weeks to over six months, according to moisture conditions ; many eggs from the second and third generation do not appear to hatch until after the following dry season. There are four nymphal stages, lasting five to seven weeks, during which the insects are protected by a white froth, while they suck the sap from the roots at and below the ground surface. The complete life-cycle under normal wet-season conditions takes rather less than two months. Other food-plants are various Gramineae and some Cyperaceae ; hill-rice, maize and pastures have also been attacked. The first generation of adults appears in June or July, the second usually in September, and the third about two months later. Very rarely a fourth generation appears about December, the later generations overlapping somewhat.

Other species of froghopper that occur in Trinidad are :—*T. rubra*, on *Eupatorium* ; *T. pubescens*, on grass in moist places, serving as an alternate host of parasites of *T. saccharina* ; *T. guppyi*, feeding on grass ; and an unidentified species found on a creeper in the mountains. *Clastoptera* spp. feed on *Casuarina* and *Hibiscus*, and *Cephisus* sp. is thought to feed on immortelle [*Erythrina*].

The natural enemies of the froghopper include the egg-parasite, *Oligosita giraulti*, which requires about 30 days for its life-cycle and breeds chiefly during the dry season, when the froghopper is inactive. It is probably native to Trinidad, and will not increase much beyond its present numbers. Other egg-parasites of less value are *Paraphelinus tomaspidis* and *Anagrus* sp. ; *Haplothrips* spp. and ants are predators. The nymphs are eaten by a few birds, but their most important enemy is a Syrphid fly (*Salpingogaster nigra*), which oviposits in the froth, the resulting maggot, which hatches two days later, destroying the nymphs by piercing their skin and sucking out the body juices. The life-cycle of this fly occupies about three weeks ; in the moister localities it occurs throughout the year, but in cane fields it is seldom seen before the second or third generation of frog hoppers. A Nematode, about which very little is known, is occasionally found in the body of the nymph or adult.

There are many parasites and enemies of the adult froghopper, including many birds, lizards, the grasshoppers, *Xiphidium* and *Pflugis*, ants, Reduviids and Attid spiders. The green muscardine fungus (*Metarrhizium anisopliae*) is probably the most important natural check, generally appearing with the later generations, if conditions are favourable for it. Attempts to disseminate this fungus have as yet given inconclusive results, but the subject is worth further investigation. Another fungus, a species of *Empusa*, kills many adults, but never appears before October, and is much rarer than *M. anisopliae*.

An account is given of the cane-root fungi of the *Marasmius* and *Odontia-Himantia* types, and the effects of weather conditions [*R.A.E.*, A, viii, 131], type of soil, drainage and manuring, the age of the cane, rotation, tillage and varieties of cane used [*R.A.E.*, A, vii, 531] are discussed. The relative importance of adult and nymph froghoppers and of root disease is reviewed. The froghopper is considered the most important cause of blight because of its constant presence in affected areas, the streaking of the leaves, the occurrence

of blight when no other complicating disease is present, the correspondence between the first appearance of blight and the first generation of froghoppers, and the periodicity of the blight. The spread of injury from the original point of infection indicates the possibility of some toxin or enzyme being introduced into the plant. Root disease plays an important part as a secondary factor.

The most important factor in determining the prevalence of blight is the humidity just above and just below the surface of the ground. A table indicates the known effect of moisture on the cane, the root fungi, the froghopper and its enemies.

The essential preventive against blight is to keep the soil and crop in such condition that no encouragement to the breeding of froghoppers is produced. To this end, drainage should be improved, and should be kept in working order even on land temporarily abandoned. Pen manure and lime are required on almost all land in Trinidad. The tilth and depth of the surface soil requires careful attention. Only plant and first ratoon canes should be grown on lands that prove constantly liable to blight, until the soil can be worked into better condition. Graminaceous crops are not recommended for rotation, but Leguminous crops have given success, particularly Bengal beans, cowpeas, and sword beans ; yams and sweet potatoes also may be used.

Direct remedial measures are the destruction of eggs by the removal of dead leaves about ten days after the maximum numbers of any generation, the rubbish being carried to the pens and later used as pen manure. Weeding should be done at the same time. Burning destroys the eggs, but is a wasteful method. Spraying is not practicable. Hand collection of nymphs and adults is possible but tedious. Spraying with kerosene emulsion has been suggested, but has not been tried in the field. Light traps catch many adults, but only about 1 per cent. of these are females. The adults can be caught in large numbers by the use of nets in late evening and early morning. Trials are being made with nets drawn by mules. Natural enemies should be encouraged wherever feasible and watch should be kept for possible new ones.

SIMMONDS (H. W.) & KNOWLES (C. H.). **A Disease of** *Clidemia hirta* **in the Lower Rewa District.**—*Mthly. Circ. Information Fiji Dept. Agric., Suva,* i, no. 1, January 1920, pp. 9–12. [Received 29th March 1921.]

A disease said to be killing a weed, *Clidemia hirta,* appears to be first brought about by Nematodes, *Heterodera* sp., and then continued by fungi. There is no doubt that in the areas affected the weed is dying out, and valuable crops such as paspalum and reeds are now replacing it. In the poorer class of land under consideration the cost of clearing would be prohibitive. The general use of this organism as a means for checking *Clidemia* in Fiji is deprecated, as Nematodes are known pests of cultivated plants there.

SIMMONDS (H. W.). **Report on Mission to Tahiti to investigate the Parasites of the Coconut Scale with a View to their Introduction into Fiji.**—*Mthly. Circ. Information Fiji Dept. Agric., Suva,* i, no. 7, July 1920, pp. 133–138. [Received 29th March 1921.]

The author left Fiji for Tahiti early in 1920 in search of parasites of *Aspidiotus destructor.*

At Tahiti the scale is almost entirely confined to the coast, and is most common in places exposed to the prevailing winds, which appear to protect it somewhat against its very frail winged enemies. Many

of the scales were parasitised by a Hymenopteron, which was easily bred out in numbers, but proved exceedingly frail, seldom living more than two or three days in captivity. It takes about six weeks to complete its life-cycle.

At the base of the stalks of the coconut leaves large numbers of another scale, *Chionaspis* sp., were observed, and 75 per cent. of these were parasitised, apparently by the same enemy that attacks *A. destructor*. As *Chionaspis* occurred and was under control in Tahiti prior to the introduction of *A. destructor* about 25 years ago, it would seem that the Chalcid was there before the arrival of the coconut scale and has adapted itself to the latter ; the more so as the author believes that he bred the same Chalcid from *Diaspis* sp., a scale that was not uncommon. Some imported palms were badly attacked by *A. destructor*, which, in turn, was infested with another larger Hymenopterous enemy, which may be a recent importation.

The author sent to Fiji consignments of *A. destructor* parasitised by both Chalcids, and after his return found reason to believe that the larger species was established, although it is possible that this establishment is not final, in view of the very small number of parasites that arrived owing to various adverse circumstances. A further importation may therefore prove desirable.

In addition to the three Coccids mentioned, the coconut in Tahiti is attacked by the caterpillar of a small Tineid moth [*Decadarchis* sp.n.]. It does much damage on some estates, and, next to *A. destructor*, is perhaps the worst enemy of coconut on the island. Of the two injurious weevils recorded by Doane, *Rhabdocnemis* (*Sphenophorus*) *obscura* and *Diocalandra* (*Calandra*) *taitensis*, the author only found the former, which also infests sugar-cane ; he is inclined to believe that it only attacks palms in which a certain amount of fermentation of the sap is taking place, such as would be caused by a slight mechanical injury.

During this mission a visit was made to the Cook Islands, where the banana beetle [*Cosmopolites sordidus*] was doing considerable damage. *Mytilaspis citri* and a species of *Lecanium* occur in the islands, and the author bred Chalcid parasites from both. A species of *Aphis*, checked by Coccinellids and by Syrphid flies, occurs, while a mealy-bug does some damage. The worst pest is the fruit fly, *Dacus melanotus*, Coq. (*rarotongensis*), living on guava and other wild fruits and also attacking oranges.

At Tahiti there is a variety of coconut which is said to possess decided astringent properties, and this might prove immune against the Fijian leaf-eating moth, *Levuana iridescens*.

Extracts from Reports of Inspectors.—*Mthly. Circ. Information Fiji Dept. Agric., Suva*, i, nos. 1–12, January–December 1920. [Received 29th March 1921.]

These extracts are published in each monthly issue and contain much local information.

There is a popular belief that high winds reduce infestation by coconut scale, *Aspidiotus destructor*. It may be mentioned that in July 1920 palms in the Yasawa groups were only recovering from the effects of the storm of 1919, and this probably accounted for the fact that the scale was scarce, practically none being found on the leaves, the infestation being chiefly on the nuts and stems.

The leaf-miner, *Promecotheca reichei*, does much damage in some localities.

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Publication Office.—41, Queen's Gate, London, S.W. 7.

Maskew (F.) & Strong (L. A.). **Quarantine Division. Reports September-December.**—*Mthly. Bull. California Dept. Agric., Sacramento,* ix, no. 12, December 1920, pp. 721–735. [Received 29th March 1921.]

The following pests were intercepted during the months September–December :—From Balboa, *Lepidosaphes beckii* and *Selenaspidus articulatus*. From the Panama Canal Zone, *Monomorium pharaonis* in herbs and *Lepidosaphes beckii* on grapefruit. From Central America, *Chrysomphalus aonidum, Pseudococcus* sp., *Rhabdocnemis obscura* and *Aspidiotus cyanophylli* on bananas, and larvae of *Heilipus lauri* in avocado seeds. From China, *Carpophilus hemipterus* and *Silvanus surinamensis* in cotton seed ; *Lasioderma serricorne, Tenebroides mauritanicus, Cathartus advena, Catorama* sp., Lepidopterous larvae, Hymenopterous parasites, Psocids, Capsids and Embiids in various herbs ; *Calandra* sp., in seed ; an undetermined weevil in sweet potatoes ; and *Rhizopertha dominica* in beans and rice paste. From Argentina, *Calandra oryzae, Tribolium confusum* and *Sitotroga cerealella* in maize. From Hawaii, *Chrysomphalus aonidum, Hemichionaspis minor, Ripersia palmarum, Pseudococcus* sp., *Chionaspis inday, Diaspis* sp., and *Parlatoria* sp. on coconuts ; *Pseudococcus bromeliae* and *Diaspis bromeliae* on pine-apples and bananas ; *Coccus elongatus* and Aphids on betel leaves ; Lepidopterous larvae in seed pods ; *Lepidosaphes crotonis* and *Pseudococcus* sp., on croton cuttings ; *Lasioderma serricorne* in anise seed ; Drosophilid larvae and *Lepidosaphes beckii* on oranges ; Trypetid larvae in cucumbers ; and *Pseudococcus pseudonipae* on palms. From Italy, Coleoptera in dried chestnuts. From Japan, *Bruchus pisorum* in dried peas ; *Aspidiotus camelliae* on pears ; Lepidopterous larvae in cotton-seed meal cake, Chili pepper and chestnuts ; Coccids on pears ; Curculionid larvae in acorns ; *Parlatoria pergandei* on maple trees ; and *Lepidosaphes gloveri* and *Hemichionaspis aspidistrae* on oranges and grapefruit. From Holland, *Cathartus advena*, larvae of *Merodon equestris, Eumerus strigatus*, a Staphylinid and mites in bulbs. From Mexico, Coccids on limes ; *Calandra linearis, Echocerus maxillosus, Lasioderma serricorne* and *Rhizopertha dominica* in pumpkin and tamarind seed ; *Coccus hesperidum* on lemons ; *Lepidosaphes beckii* on limes and oranges ; and *Tenebroides mauritanicus, Bruchus quadrimaculatus, Tribolium ferrugineum, Rhizopertha dominica, Calandra (Sitophilus) oryzae* and *Ephestia* sp. in chick peas [*Cicer arietinum*]. From England, *Aspidiotus* sp. on apples. From Alabama, *Lepidosaphes beckii* on oranges. From Arkansas, *Cydia (Laspeyresia) pomonella, Lepidosaphes ulmi* and *Aspidiotus perniciosus* on apples. From Arizona, *C. pomonella* on apples. From Colorado, *A. perniciosus* and *C. pomonella* on apples ; and *Lepidosaphes beckii* on grapefruit. From Illinois, *C. pomonella, Lepidosaphes ulmi* and *A. perniciosus* on apples. From Iowa, Aphids on rose plants and *C. pomonella* on apples. From Indiana, *A. perniciosus* and *L. ulmi* on apples. From Florida, *L. beckii* on grapefruit and oranges, and *Parlatoria pergandei* on avocados and oranges. From Kansas, *C. pomonella* in apples ; *Tetranychus bimaculatus* in strawberry plants ; *L. beckii* on grapefruit ; and *A. perniciosus* on apples. From Louisiana, *L. beckii* on oranges. From Massachusetts and Maine, *C. pomonella* and *A. perniciosus* on apples. From Maryland, *Phthorimaea operculella* in potatoes. From Michigan, *C. pomonella, A. perniciosus* and *L. ulmi* on apples ; and *L. beckii* on grapefruit. From Minnesota,

C. pomonella and *Aspidiotus* sp. on apples. From Montana, *C. pomonella* in apples, and *Heliothis* (*Chloridea*) *obsoleta* in green maize. From Oregon, *C. pomonella* in pears and cider apples ; *A. perniciosus* on pears and apples ; larvae of *Aegeria rutilans, Julus* sp., *Scymnus* sp. and a Capsid on strawberry plants ; *Hemichionaspis aspidistrae* on *Aspidistra* ; and *L. beckii* on grapefruit. From Ohio, *C. pomonella* and *A. perniciosus* on apples ; *Aphis* sp., *Pantomorus fulleri* and *Tetranychus* sp. on rose plants ; *Pseudococcus* sp. on *Lantana* and geranium ; *Coccus hesperidum* ; and *Saissetia oleae* on oleander. From Nevada, *C. pomonella* in apples ; and *Heterodera radicicola* in potatoes. From New York, *C. pomonella* and *A. perniciosus* on apples ; Lepidopterous larvae in beans ; *Silvanus surinamensis* in dates ; and *L. beckii* on oranges. From Nicaragua, *Bruchus obtectus* in beans. From Porto Rico, *L. beckii* on grapefruit and oranges. From Pennsylvania, *C. pomonella* and *A. perniciosus* on apples, Aphids on rose bushes and *Tetranychus* sp. on violet plants. From the Philippines, *Sitotroga cerealella, Calandra* (*Sitophilus*) *oryzae, Laemophloeus pusillus, Cathartus advena, Silvanus surinamensis, Tenebroides mauritanicus, Tribolium castaneum* (*ferrugineum*) and unidentified Coleoptera in maize. From Tahiti, Lepidopterous larvae in castor beans ; *Pseudococcus* sp. on pineapples ; *Euscepes batatae* in sweet potatoes ; Coccids on green coconuts ; *Lepidosaphes beckii* on orange peel ; and *Hemichionaspis minor* on coconuts. From Texas, *Cylas formicarius* in sweet potatoes ; and *Aleurodes citri* on ornamental cuttings and *Gardenia*. From Utah, *C. pomonella* in apples ; and *L. beckii* and *Parlatoria pergandei* on grapefruit. From Washington, *A. perniciosus, L. ulmi* and eggs of *Tetranychus* sp. on apples ; *C. pomonella* in apples and pears ; and *Dendroctonus* sp. in a pine tree. From Scotland, *Tetramorium caespitum, Tribolium castaneum,* centipedes and Collembola on ornamental plants.

Jagger (I. C.). **A transmissible Mosaic Disease of Lettuce.**—*Jl. Agric. Res., Washington, D.C.,* xx, no. 10, 15th February 1921, pp. 737–739, 1 plate.

At Sanford, Florida, a serious infectious disease of lettuce was observed in 1920. It appears to be caused by a parasite that is not capable of isolation through ordinary microbiological or bacteriological technique. Experimental transmission from diseased to healthy plants has been effected by means of Aphids, particularly *Myzus persicae,* Sulz. From the symptoms and general character of the disease, it should undoubtedly be recognised as a true mosaic disease of lettuce.

Middleton (W.). **Leconte's Sawfly, an Enemy of Young Pines.**—*Jl. Agric. Res., Washington, D.C.,* xx, no. 10, 15th February 1921, pp. 741–760, 3 figs, 5 plates.

A detailed description is given of the various stages of *Neodiprion lecontei,* Fitch, with a summary of its life-history.

The larva is an important enemy of young pines in the eastern part of the United States, being especially injurious to nursery stock by defoliating the trees. Even in cases of incomplete defoliations, the tree is often stunted or misshapen. In large natural or artificial areas of forest remedial measures are too expensive, but colonies of the larvae

should be destroyed whenever found by knocking them from the trees and crushing them. In nurseries and parks, heavy infestations should be combated before the larvae are full-grown by spraying very thoroughly. A lead arsenate solution containing 2 lb. powder in 50 U.S. gals. water should be satisfactory. For young larvae, less than $\frac{3}{8}$ inch long, nicotine sulphate is fairly satisfactory, but in view of the resistance of conifers to arsenical sprays, and of the fact that an arsenical treatment gives more certain results, the former spray should be used almost exclusively. Whenever these insects have occurred and have been dealt with the territory should be carefully surveyed for the suceeding fourteen months, as some larvae may have escaped treatment and a new infestation may arise.

N. lecontei appears to have three primary food-plants, *Pinus banksiana* (jack pine), *P. resinosa* (red pine), and *P. virginiana* (scrub pine), and a number of secondary or possible ones, not capable of supporting all the stages or of being entirely acceptable for oviposition. These are *P. strobus, P. sylvestris, P. taeda, P. contorta, P. monticola, P. mughus, P. eldarica, P. ponderosa, P. palustris, P. austriaca,* and *Larix americana.*

This sawfly is subject to the attack of a wilt, probably a bacterial disease, and to infestation by parasitic insects, including the Hymenoptera, *Exenterus diprioni,* Rohw., *Lagorotis diprioni,* Rohw., *L. virginiana,* Rohw., and *Perilampus hyalinus,* Say, and the Diptera, *Phorocera claripennis,* Macq., *Adomonita demylus,* Wlk., *Neopales maera,* Wulp, and *Spathimeigenia spinigera,* Towns. Of the Hymenopterous parasites, *L. diprioni* is much the most abundant species and *P. hyalinus* is probably a hyperparasite. It is, however, certain that none of these natural enemies is sufficiently numerous or effective to permit disregard of the combative measures suggested above.

Greene (C. T.). U.S. Bur. Ent. **Dipterous Parasites of Sawflies.**—*Proc. Ent. Soc., Washington, D.C.,* xxiii, no. 2, February 1921, pp. 41–43.

The parasites recorded include :—*Tachina rustica,* Fall.,and *T. mella,* Wlk., bred from *Macremphytus variana,* Nort. ; *Phorocera claripennis,* Macq., from *Neodiprion lecontei,* Fitch, and *N. virginiana,* Roh. ; *Spathimeigenia spinigera,* Towns., from *N. edwardsi,* Nort., *N. lecontei, N. affinis,* Roh., and other species of this genus ; *Admontia hylotomae,* Coq., from *Arge* sp., *N. lecontei,* and another sawfly ; *Sturmia* sp., from *Arge* sp. ; *Masicera* sp., from *N. lecontei* ; *Frontina armigera* Coq., and *Exorista petiolaia,* Coq., from *Neodiprion* sp.

Geismer (L. M.). **The Tachina Fly** (*Phorocera doryphorae*)**, an interesting Parasite on Potato beetles.**—*Potato Mag.,* iii, no. 3, 1920, p. 8. (Abstract in *Expt. Sta. Record, Washington, D.C.,* xliv, no. 3, 21st March 1921, p. 255.)

Attention is called to the control of the Colorado potato beetle [*Leptinotarsa decemlineata*] in certain localities in the upper peninsular of Michigan by the Tachinid, *Doryphorophaga* (*Phorocera*) *doryphorae.* In the summer of 1900, in certain localities of Alger County, the beetles could scarcely be found, while in the vicinity of the upper peninsular experiment station they were quite numerous, almost every adult, as well as some of the larger larvae, being covered with from one to eight or even more eggs of this parasite. The beetles were scarce in the

vicinity of the experiment station during the following season, and neither flies nor their eggs could be found. Despite careful watch, none have been seen or reported since that year. During the season of 1920 there were localities in Houghton County where the potato beetle was very scarce, and others in which they were quite abundant, thus resembling the condition in Alger County in 1900. In the Dodgeville district the beetle was very numerous, and practically all the beetles, as well as the full-grown larvae, found were covered with from one to five or more eggs of the parasite. Evidence of the existence of this parasite gradually disappeared in all directions from this point, until, in potato fields five miles away, eggs were only found on less than one per cent. of the beetles or larvae.

These observations indicate that *D. doryphorae* is at work in large numbers in restricted areas only, though it covers an extensive territory. They also indicate that the fly either migrates from year to year to other localities, or else has other hosts upon which it develops from time to time. That the flies cannot increase to any extent is due to the poisoning of the potato beetles, a practice that has become quite general, for the poisoned beetles dry up rapidly, leaving the young maggots of the Dipteron without food.

DE STEFANI (T.). **Importanza dell' Entomologia applicata nell' Economia sociale.** [The Importance of Applied Entomology in Social Economy.]—*Allevamenti, Palermo,* ii, nos. 1–3, January–March 1921, pp. 7–10, 35–37, 70–72.

These are the first three parts of a paper aiming at making known the economic importance of applied entomology. A number of successful solutions of problems, such as the introduction of *Novius cardinalis* against *Icerya purchasi,* are enumerated and discussed.

S. **Bekämpfung der tierischen Schädlinge unserer Obstbäume.** [Measures against the Animal Enemies of our Fruit-trees.] *Schweiz. Zeitschr. Obst. u. Weinbau, Frauenfeld,* xxx, no. 6, 24th March 1921, pp. 85–86.

Attention is drawn to legislation existing since 1867 in the Swiss Canton of St. Gall against various fruit-tree pests, and to an ordinance passed in 1870 with regard to outbreaks of cockchafers [*Melolontha melolontha*].

ANTONELLI (G.). **Calendario Forestale Italiano 1921.** [The Italian Forestry Calendar for 1921.]—*Rome,* Federazione pro Montibus, 1921, 320 pp. Price Lire 7.50.

This volume contains a mass of information valuable to foresters. A section by Prof. G. Trinchieri mentions the common insect and fungous pests and the usual measures adopted against them.

BERNARD (C.), DEUSS (J. J. B.) & others. **Bibliografisch Overzicht iii.** [Bibliographical Review iii.]—*Meded. Proefst. Thee, Buitenzorg,* lxxii, 1920, 116 pp. [Received 30th March 1921.]

About 75 papers relating to tea cultivation are briefly abstracted. Those of entomological interest have already been noticed in this *Review.* The period covered extends roughly from 1913 to 1918. The first of these reviews was issued in 1908 and the second in 1912.

BERNARD (C.). **Enkele Aanteekeningen betreffende de Theecultuur in Japan.** [Some Notes on Tea Cultivation in Japan.]—*Meded. Proefst. Thee, Buitenzorg,* lxxiii, 1920, pp. 1–11, 5 plates. [Received 30th March 1921.]

Tea in Japan suffers scarcely any injury from insect and fungous pests. The former are represented by leaf-rollers, Aphids, and caterpillars. The robustness of the Chinese tea-plant, the presence of natural enemies, such as spiders, and the severe winters, are the reasons given for this immunity.

COHEN STUART (C. P.). **Gegevens betreffende de Theekultuur in Siam en Burma.** [Information relating to Tea Cultivation in Siam and Burma.]—*Meded. Proefst. Thee, Buitenzorg,* lxxiii, 1920, pp. 12–34, 2 maps. [Received 30th March 1921.]

Very little information can be given regarding insect pests of tea in Burma. A borer, *Zeuzera coffeae,* and a scale, *Aspidiotus transparens,* occur there. *Helopeltis* does not appear to have been recorded.

CHITTENDEN (F. H.). U.S. Bur. Ent. **Description of a New Species of** *Sphenophorus* **from Florida (Coleoptera).**—*Jl. Wash. Acad. Sci., Washington, D.C.,* x, no. 11, 4th June 1920, pp. 313–314. [Received 30th March 1921.]

Sphenophorus deficiens, sp. n., from Florida is described.

CHITTENDEN (F. H.). U.S. Bur. Ent. **A New Species of** *Phyllotreta.*—*Jl. Wash. Acad. Sci., Washington, D.C.,* x, no. 13, 19th July 1920, pp. 389–390. [Received 30th March 1921.]

Phyllotreta utana, sp. n., from Utah, Nevada and Oregon is described. Like other beetles of this genus, it attacks and undoubtedly breeds on cruciferous plants, and is at least a potential pest. It was abundant on sugar-beet in a field overgrown with hedge mustard, on which it was also taken.

McDONALD (R. E.) & TANQUARY (M. C.). **Report on the Pink Bollworm Situation in Mexico.**—*Mthly. News Bull., Texas Dept. Agric., Austin,* iii, no. 5, February–March 1921, pp. 6–7.

This report was made as the result of a visit—from 26th November to 1st December 1920—to the Laguna region of Mexico. Certain limited areas in Texas and Louisiana are now infested with *Platyedra gossypiella,* and this infestation came from Mexico.

Counts, made with care so as not to exaggerate the damage, showed a pink bollworm infestation ranging from 38 to 83 per cent. Other cotton pests include the cotton boll weevil [*Anthonomus grandis*], which appears to have been present for 25 years or more, but does not do much injury, probably owing to the arid climate; melon Aphids, which sometimes infest young cotton in spring and retard growth; and a species of thrips. The common bollworm, *Heliothis obsoleta,* and the leaf worm, *Alabama argillacea,* are of scarcely any importance.

In the year 1911 a planter near Monterey, Mexico, brought 125 sacks of cotton seed from Egypt, and the pink bollworm evidently reached the Laguna region from this source. There was probably a slight infestation in 1913, but no notice was taken of it. During 1920 the damage has been very severe, and the infestation seems to be

reaching its maximum. As the cotton-growing region of Texas is not very different climatically from the Laguna district, and in view of the fact that *P. gossypiella* is already present in some counties of Texas, it is urged that every step possible should be taken to eradicate the pest in those counties where it already exists and that every precaution be taken to prevent its re-establishment in Texas.

Review of Agricultural Operations in India, 1919-20—*Calcutta,* 1921, pp. 48-53.

Much of the work reviewed in this report under the headings of insect pests and useful insects has already been noticed in detail [*R.A.E.*, A, ix, 72-80, etc.].

Donisthorpe (H.). **A new Record for** *Eriosoma lanigerum.*—*Ent. Record and Jl. Var., London,* xxxiii, no. 4, 15th April 1921, p. 77.

Attention is drawn to the occurrence of *Eriosoma lanigerum* on a shrub (*Cotoneaster* sp.). This is apparently the first record of this food-plant.

Bagnall (R. S.). **On** *Physothrips latus,* **Bagn., and some allied Species.**—*Ent. Mthly. Mag., London,* 3rd Ser., no. 75, March 1921, pp. 61-64.

The thrips dealt with include *Physothrips propinquus,* sp. n., on *Pinus,* which is apparently *P. latus,* Williams (*nec* Bagn.), and *P. consociata,* Targ., (*ulmifoliorum,* Uzel, *nec* Hal.). The common species on elm is *Scirtothrips ulmi,* Bagn., which the author now considers to be a synonym of *S.* (*Thrips*) *ulmifoliorum,* Hal.

Lemaire (P.). **Les Ennemis de la Cire.**—*La Vie Agric. et Rur., Paris,* xviii, no. 13, 26th March 1921, pp. 202-203, 1 fig.

This is a popular article on the wax moth, *Galleria mellonella.* This pest only attacks weak colonies of bees and never approaches combs covered with bees; it can be destroyed by fumigation with carbon bisulphide, which is equally useful against the bacon beetle [*Dermestes lardarius*], which feeds on wax left in dark places.

Rolet (A.). **La Destruction des Courtilières.**—*La Vie Agric. et Rur., Paris,* xviii, no. 13, 26th March 1921, pp. 205-206, 1 fig.

A popular account is given of the mole-cricket, *Gryllotalpa gryllotalpa* (*vulgaris*), and of the measures usually adopted against it, including subterranean fumigation with carbon bisulphide, napthaline, or lump calcium carbide; poison-baits; shelter-traps and light-traps; and destruction by hand.

Vermorel (V.) & Dantony (E.). **Composition chimique des Bouillies sulfo-calciques employées contre les Insectes et les Maladies des Plantes.**—*Villefranche* (*Rhône*), Librairie agricole du "Progrès agricole et viticole," 1919, 20 pp. [Received 31st March 1921.]

The authors state that their investigations on the chemical composition of lime-sulphur sprays, to which their variability of action is undoubtedly due, were nearly finished when their attention was drawn to Tartar's work on this subject [*R.A.E.*, A, ii, 543], and to an earlier (1910) paper by Van Slike, Bosworth and Hedges, "Chemical Investigations of the best Conditions for making the Lime-Sulphur Wash."

Their conclusions confirm those of the above American workers on many points, and throw new light on others. In any case the American investigators used pure or quasi-pure products, especially limes containing only traces of impurities, whereas the authors used commercial limes that were partly carbonated, as is generally the case. The resulting differences are very important.

Lime-sulphur solutions may contain the following substances :—In solution : Calcium thiosulphate, calcium tetrasulphide, calcium pentasulphide, and calcium oxysulphide ; in sediment : sulphur, lime, calcium sulphite, calcium sulphate, and calcium oxysulphide. All the other substances that have been reported, such as lime in solution, hydrosulphates, etc., are not met with.

The relative proportions of the dissolved constituents vary according to a number of factors. At ordinary temperatures, and after several months, oxysulphides of calcium, calcium thiosulphate, and a little calcium tetrasulphide are formed. The quantity of soluble salt formed increases with a rise of temperature up to 100°C. (212°F.), and at high temperatures the sulphides predominate. This results in an actual increase of thiosulphate, though its percentage to the sulphides decreases. The content of dissolved sulphur increases with the period of boiling up to 45 minutes, after which it decreases. At first, a tetrasulphide is formed ; the pentasulphide appears gradually afterwards.

The maximum quantity of sulphur in solution is obtained when 3·2 parts of sulphur to 1 part of lime are used. Any variation of this proportion decreases the amount of sulphur. Above 2·9 of sulphur to 1 of lime, pentasulphides are obtained ; below that proportion a mixture of tetrasulphide and pentasulphide results. The percentages of lime and of sulphur that dissolve increase as the quantity of water is increased up to 3·1 parts water to 1 of the mixture of lime and sulphur. If more water is used the percentages diminish. The proportion of calcium thiosulphate decreases with an increase of the time of cooling. The greater the surface exposed to the air the more calcium thiosulphate is formed. Magnesium causes considerable loss of sulphur and leads to a release of sulphuretted hydrogen. Limes containing magnesium should therefore be rejected. If the sediment contains an excess of lime, calcium oxysulphides are formed.

It will be seen that in agricultural practice it is very difficult to master all the above factors and to obtain a standard solution of constant strength unless the services of an expert chemist are available. The density of the solution is no guide to its sulphur content. Furthermore, sprayers with copper parts soon perish ; either aluminium or some special brass alloys must be used. The variability of its action and its destructive effect on the usual sprayers have retarded the general adoption of lime-sulphur, in spite of its manifest advantages. Nothing can replace it in certain cases, and this spray is very much cheaper than the copper solutions and insecticides in common use.

Tillyard (R. T.). **Report on the Neuropteroid Insects of the Hot Springs Region, N.Z., in relation to the Problem of Trout Food.**—*Proc. Linn. Soc. N.S.W., Sydney*, xlv, pt. 2, 16th August 1920, pp. 205–213, 2 figs ; also *N.Z. Jl. Sci. & Technol., Wellington*, iii, no. 5–6, January 1921, pp. 271–279, 2 figs.

The food of trout consists largely of insects, especially of *Pyronota festiva* (green manuka beetle) and caddis flies and other Neuropteroid

insects. Owing to the abundance of the fish, the food-supply in the Hot Springs region in New Zealand is practically exhausted. Suggestions are made for the restoration of the natural balance between the trout and their food-supply so that the failure of these fisheries may be averted.

Fletcher (T. B.) **Life-histories of Indian Insects: Microlepidoptera.**—*Mem. Dept. Agric. India, Pusa,* Ent. Ser., vi, nos. 1–9, November 1920, 217 pp., 68 plates. [Received 4th April 1921.]

At the present time some 458 genera and 2,422 species of Microlepidoptera are recorded from India, though many regions remain unexplored in this respect. Knowledge of the life-histories of these small moths is very incomplete; the present paper deals with the early stages of some 396 species, the information being compiled from existing and unpublished records of the Pusa Research Institute.

The species dealt with include the Pterophorids, *Diacrotricha fasciola,* Z., which feeds on flowers of *Averrhoa bilimbi,* a cultivated tree, by means of which it may be artificially spread; *Oxyptilus lactucae,* sp. n., on lettuce; *O. causodes,* Meyr., on the fruit of *Dillenia retusa*; *Platyptilia citropleura,* Meyr., the larvae of which feed in the seed-capsules of *Begonia* sp.; *P. pusillidactyla,* Wlk., which attacks *Lantana* and was introduced from Hawaii into Mexico to aid in reducing that plant; *Exelastis atomosa,* Wlsm., an important pest of *Cajanus indicus* (pigeon pea) on which it is found in all stages when the crop is coming into flower and bud, and has for an alternate food-plant the bean, *Dolichos lablab*; the Carposinid, *Meridarchis reprobata,* Meyr., in fruits of *Eugenia jambolana* and olives; the Phaloniid, *Clysia ambiguella,* Hb., recorded from three districts, but not yet noted as a pest in India; the Tortricid, *Homona coffearia,* Nietn., not considered a serious pest of tea, although it occurs throughout the tea districts of north-east India; the Eucosmids, *Eucosma melanaula,* Meyr., a common pest of *Cajanus indicus, Phaseolus radiatus, P. mungo* and *P. aconitifolius*; *Argyroploce paragramma,* Meyr., a pest of bamboo, the larvae boring in the shoots; *Laspeyresia ptychora,* Meyr., feeding in pods of the cowpea (*Vigna sinensis*) and of *Cajanus indicus*; *L. jaculatrix,* Meyr., the larvae of which are abundant in the bark of *Dalbergia sissu,* whence they emerge to feed on the leaves, and are attacked by a Bombyliid fly and by a Hymenopterous parasite; *L. pseudonectis,* Meyr., which attacks sann-hemp (*Crotalaria juncea*), forming galls on the top shoots and also feeds on *Phaseolus mungo* and *Dolichos biflorus*; *Cydia* (*L.*) *pomonella,* L., which has been recorded from Kashmir, but does not appear to be known in the apple-growing regions of India; and *L. pulverula,* Meyr., and *Pammene theristis,* Meyr., both from *Shorea robusta.*

Gelechiids include *Sitotroga cerealella,* Ol., in stored grain, which has also been reared from bamboo seeds; *Phthorimaea heliopa,* Low., generally a minor pest of tobacco, but occasionally a major pest in western India, the larvae boring in the leaves, midrib and stem; *P. operculella,* Z., introduced from Italy about 20 years previously and now an important potato pest; *Stomopteryx nerteria,* Meyr., on *Cajanus indicus,* soybean and groundnut, of which it is an important pest in Madras; *Platyedra gossypiella,* Saund., the pink bollworm of cotton, which is probably native to India; *Dactylethra candida,* Stn., which makes galls on shoots of wild indigo; *Brachmia engrapta,* Meyr.,

on sweet potato ; *Paraspistes palpigera*, Wlsm., the larvae occurring in pods of wild indigo and *Cassia* spp. ; and *Dichomeris ianthes*, Meyr., generally a minor pest of indigo and lucerne, but causing a serious infestation of Java indigo in 1909.

Cosmopterygids include *Pyroderces callistrepta*, Meyr., which mines the leaves of teak (*Tectona grandis*) forming blisters on the leaves. The Stenomid, *Synchalara rhombota*, Meyr., used to be a serious pest on tea-bushes and is still very injurious in part of North Lakhimpur. The Heliozelid, *Antispila argostoma*, Meyr., mines the leaves of *Vitis trifolia* ; the Heliodinid, *Stathmopoda sycophaga*, Meyr., bores into figs (*Ficus glomerata*) in the larval stage and pupates within the fruit ; larvae of *S. basiplectra* burrow into the seeds of *Albizzia lebbek*, and also devour lac to some extent ; the caterpillars of *S. sycastis*, Meyr., damage edible figs (*Ficus carica*) in the Peshawar district ; *Oedematopoda venusta*, Meyr., was bred from colonies of *Tachardia lacca* (lac insect) ; and *O. cypris*, Meyr., from a colony of *T. albizziae* on *Theobroma cacao*. The Blastobasid, *Holcocera pulverea*, Meyr., is abundant in practically all the forests from which lac is obtained. the larvae feeding on colonies of *Tachardia lacca*, and also on dry shellac on the cut sticks, where they have been found three months after the lac has been removed from the trees. The Hyponomeutid, *Prays citri*, Mill., is a serious pest of oranges and other species of *Citrus*, feeding in the shoots and eating into all the flower organs. *Comocritis pieria*, Meyr., is a bark-eating borer of tea, the larvae webbing the stems and eating a thin layer of bark from the surface ; the remedy in Assam is to remove all twigs, dead wood, etc., when pruning. The larvae also construct galleries in the bark of *Hevea brasiliensis* (Para rubber).

The Gracillariid, *Lithocolletis triarcha*, Meyr., mines the leaves of cotton in the Plains districts; *Acrocercops prosacta*, Meyr., mines the leaves of sweet potato ; *A. desiccata*, Meyr., gives rise to blotches on the leaves of *Ficus glomerata* caused by the larval mines ; *Gracilaria zachrysa*, Meyr., damages apple leaves, the larvae forming cones on the leaves of *Pyrus malus*, on which they feed and being sometimes a considerable pest throughout northern India ; and *G. theivora*, Wlsm., feeds upon tea (*Camellia theifera*), the larvae rolling one leaf after another and feeding on the epidermis.

The Plutellid, *Plutella maculipennis*, Curt., occurs in all cabbage-growing districts, the larvae eating the leaves of cabbage, cauliflower, radish, and other Cruciferous plants ; the Lyonetiid, *Phyllocnistis citrella*, Stn., is often a serious pest of oranges and other *Citrus* plants, the larval mines occurring just under the epidermis ; *P. toparcha*, Meyr., is a similar pest of the grape-vine (*Vitis vinifera*) ; *Bucculatrix loxoptila*, Meyr., eats holes in the leaves of Caravonica cotton ; and *Petasobathra sirina*, Meyr., webs the shoots of indigo and feeds on the leaves.

The Tineids, *Tinea pellionella*, L. (clothes-moth), *T. pachyspila*, Meyr., and *T. fuscipunctella*, Haw., occur commonly throughout India.

The Tortricid, *Tortrix* (*Cacoecia*) *pomivora*, Meyr., is a pest of apple in some districts, the larvae boring into the apical end of the fruit and tunnelling through the core ; *Ulodemis trigrapha*, Meyr., also bores into apple fruits. The Xyloryctid, *Ptochoryctis rosaria*, Meyr., is a serious pest of apple at Shillong, the larvae eating into the bark of young twigs.

ANDREWS (E. A.). **Reduction and Retrenchment from the Entomological Point of View.**—*Qtrly. Jl. Scient. Dept. Ind. Tea Assoc., Calcutta*, 1920, pt. iv, pp. 135–143. [Received 4th April 1921.]

As the Scientific Department is at present considering means of reducing output and decreasing expenditure on tea estates, it is important to remember the effect that this policy will have on insect enemies of the plant. If retrenchment is carried out carelessly, damage is bound to accrue. One fundamental fact to bear in mind is that when allowed to grow in its natural way, with the object of producing seed, tea can and does successfully resist insect attack, but when stimulated to produce unnatural leaf conditions, much of its natural power of resistance is lost. It has been observed in America that fruit trees that are allowed to remain in a state of nature for a year or two are able to throw off the attacks of certain scale-insects until they are almost free from them. When brought back into cultivation, they are able to yield heavy crops for four or five years, after which the scale-insects again get the upper hand. It is suggested that such a policy, modified to suit the circumstances, might be advantageously pursued in the case of estates suffering from mosquito blight [*Helopeltis*]. Badly affected areas might be left unpruned, unplucked and uncultivated either wholly or in part, but should not be abandoned. The centres of the bushes might be plucked lightly, and the jungle should be cut with the sickle at times to admit light and air to the bushes. Such a rest would increase the powers of resistance against sucking insects. On these areas, also, prunings should be burnt, not on the roadside, but between the lines of tea. It has been observed that land on which fires have been lighted previous to planting with tea gives remarkably vigorous plants; this seems to indicate that the partial sterilisation of the soil produced by the heat of the fire is beneficial. The practice of taking off young shoots and buds before the mosquito blight attacks them is condemned, as this gives the plant no rest or chance to resist.

These suggestions are merely experimental, and are only advocated in abnormal circumstances such as the present. One danger is the advantage given to pests over which considerable control is normally exercised by pruning and cultivation, such as borers, loopers, faggot and bag-worms and termites. On account of these, a certain amount of hoeing and pruning is obligatory. Branches that are infested with termites but are still able to bear some leaf are frequently left on the bush, and this enables the termites to extend their depredations for another season. Under present conditions such branches should be removed when pruning.

In the majority of gardens the necessary reduction in crop will probably be effected by finer plucking. This can be done either by plucking as soon as the leaf is ready, or by plucking out the finer portions of more mature leaf, leaving the remainder on the bush. As the former method forces the bush more than the latter, it permits such pests as red spider, tea mosquito and green fly to have a greater effect on the plant, and is therefore not recommended. Again, cheaper pruning implies bad workmanship and encouragement to bark-eating and other borers and termites. Any saving in expenditure should be made on the high-pruned sections and not on the low and medium-pruned areas. Reducing the processes of hoeing or neglecting to fork round the bushes will undoubtedly result in an increase of

insects that pass some part of their life in the ground, therefore these practices should be continued as far as possible, hoeing being necessary when loopers and sandwich caterpillars are observed to have left the bushes and entered the ground to pupate.

Dupont (P. R.). **Entomological and Mycological Notes.**—*Seychelles: Ann. Rept. Agric. & Crown Lands 1919, Victoria,* 1920, pp. 10–11. [Received 4th April 1921.]

Melitomma insulare kills hundreds of coconut palms in full bearing every year by attacking the stems. This beetle has not yet been found attacking other palms, although it is indigenous in Seychelles, while the coconut palm is not. After mating in galleries in the trees, the adults emerge near the roots, and eggs are laid in cracks of the stem or scars. The larvae construct galleries in the trunk running towards the soft central tissues that quickly decompose. The abdomen has a horny appendage that protects the larva from ants. The evidence of infestation is the presence of a peculiar dust near the roots and the drooping of the leaves. Dead tissue containing larvae should be removed, and the wounds tarred over. The adults do not fly well, and cannot easily cover the distance from tree to tree. The destruction of the insect has been made compulsory, as its borings enable the rhinoceros beetle [*Oryctes rhinoceros*] to enter and breed in the trunks, as well as various fungi. In consequence of the disappearance of scale-insects [*R.A.E.*, A, vii, 483], the bread-fruit, jak-fruit, hog plum and oranges are all again appearing in quantities.

Among the insects identified during the year are *Hemichionaspis aspidistrae* on areca nut palm, and *Eucalymnatus* (*Lecanium*) *tessellatus*, *L. mangiferae* and *Aspidiotus dictyospermi pinnulifera* on leaves and *Pseudaonidia iota* on bark of branches of *Eugenia caryophyllata* (clove tree). The trees are often killed by these scale-insects, which are more important than is generally realised. *Citrus mitis* is seriously damaged by *Aspidiotus dictyospermi pinnulifera*, which spoils the crop of fruit, which is used for making marmalade, and the twigs, which are distilled for oil. *Verschaffeltia splendida* (Latte palm) is severely attacked by *Aonidia obtusa* on the lower side of the leaves, and to a less extent by *Icerya seychellarum* and *E. tessellatus*. *Flacourtia cataphracta* (Madagascar plum) is becoming increasingly infested with *Diaspis flacourtiae*.

"Isle of Wight" Disease of Bees.—*Jl. Minist. Agric., London,* xxviii, no. 1, April 1921, pp. 78–81.

Recent discoveries by Dr. J. Rennie and his collaborators in connection with the Isle-of-Wight disease of bees, have led to the conclusion that the parasitic organism *Nosema apis* is not the cause of the disease, as was supposed. A new parasite, a mite belonging to the genus *Tarsonemus*, hitherto unknown on bees, was discovered on them in 1920. Several species of this genus are destructive to plants, and others have been found in malignant growths in man and animals; in structure the bee parasite seems to be most closely allied to these last. Examinations of thousands of bees have shown that those suffering from Isle-of-Wight disease invariably harboured this parasite, while *Nosema apis* was not always present. The mite infests the tracheae only, entering by the spiracles, and breeding occurs until the tracheae become partly or wholly obstructed. In the

latter case the bee dies at once, while in the former, being unable to fill the air-sacs that are necessary for flight, it is reduced to crawling. The intestines, which are usually evacuated while the bee is on the wing, thus become congested, leading to the former supposition that the disease was a digestive trouble. By blocking the thoracic spiracles of the bee with wax, all the usual symptoms of Isle-of-Wight disease have been produced. The mite has not as yet been found in any bee outside Great Britain, and seems to be peculiar to this country as a bee parasite. It is proposed to designate the new parasite *Tarsonemus woodi* and the name Acarine disease is suggested as being more satisfactory than Isle-of-Wight disease.

UVAROV (B. P.).—**A Preliminary Revision of the Genus** *Dociostaurus*, **Fieb.**—*Bull. Ent. Res., London,* xi, pt. 4, March 1921, pp. 397–407.

The genus *Dociostaurus*, Fieb. (*Stauronotus*, Fisch.), includes several species of locusts and grasshoppers injurious to agriculture, the Moroccan locust, *D. maroccanus*, Thunb., being one of the worst pests in Algeria, Tunisia, Asia Minor, the Caucasus and Turkestan. The distribution of the genus is purely Palaearctic, the centre of its development being in the tablelands of Western and Central Asia. From there different species are spreading continually in all directions, chiefly into the plains of the Palaearctic desert belt, extending through northern Africa and south-western and central Asia. The present paper aims at establishing a more or less natural system of the species, enabling them to be identified with certainty. A key to the ten species recognised and an annotated catalogue of them are given, two new species being described.

ZACHER (F.). **Tierische Schädlinge an Heil- und Giftpflanzen und ihre Bedeutung für den Arzneipflanzenbau.** [Animal Pests of Curative and Poisonous Plants and their Importance in the Cultivation of Medicinal Plants.]—*Ber. Deutschen Pharmazeut. Ges., Berlin,* xxxi, no. 2, 1921, pp. 53–65, 6 figs.

The cultivation of medicinal plants on a large scale is a comparatively new branch of agriculture in Germany. In Bohemia insect pests have appeared in large numbers on such crops, confirming the author's view that their poisonous character is no protection to them. In some cases Senft noticed that the most poisonous plants and the drugs obtained from them were infested by pests, and concluded that the latter were immune to the poisons concerned. It is therefore probable that crops of native German poisonous plants will be liable to attack. Besides indigenous plants a number of foreign ones are likely to be grown in Germany, and those that are allied to native species are also likely to be attacked. During the War the cultivation of *Chenopodium quinoa*, a native of the Peruvian Andes, proved hopeless in Germany owing to insect attack. A Microlepidopteron, *Phthorimaea* (*Gelechia*) *atriplicella*, F.R., was particularly harmful ; the caterpillars of the first generation fed on the flowers, and those of the second on the fruits and seeds.

The chances of introduced plants not allied to native ones are better, as only insects with a very wide range of food-plants are likely to attack them. Subterranean insects, such as the mole-cricket and wireworms, are the most to be feared.

The following medicinal plants and their pests are dealt with :—

Aconitum.—A leaf-beetle, *Galeruca laticollis*, Sahlb., a flea-beetle, *Crepidodera cyanescens*, Duft., and the caterpillars of *Arctia caja*, L., *Amphipyra tragopoginis*, L., *Phytometra* (*Plusia*) *variabilis*, Pill., *P. moneta*, F., and *Olethreutes charpentierana*, Hb., attack the leaves, which are also infested by *Aphis napelli*, Schr., and the larvae of *Phytomyza nigricornis*, Mg.

Conium maculatum (hemlock).—The larva of *Lixus iridis*, Ol., infests the stem. The caterpillars of *Phytometra* (*Plusia*) *gamma*, L., *Calocampa exoleta*, L., *Larentia quadrifasciaria*, Cl., *L. montanata*, Schiff., and of three species of *Depressaria* also attack this plant, another enemy of which is *Aphis rumicis*, L. (*euonymi*, F.).

Valeriana.—This plant is comparatively disliked by insects. Its leaves are eaten by the caterpillars of *Melitaea dictyma*, S., *Caradrina clavipalpis*, Scop. (*quadripunctata*, F.), *Tephroclystia valerianata*, Hb., and *Depressaria pulcherrimella*, Stn. A gall mite, *Eriophyes macrotuberculatus*, Nal., and a gall midge, *Contarinia valerianae*, Rübs., injure the blossoms.

Atropa.—Two flea-beetles, *Epitrix atropae*, Foudr., and *Psylliodes affinis*, L., the caterpillar of *Agrotis baja*, F., and a weevil, *Sitones sulcifrons*, Thb., infest this plant.

Hyoscyamus.—Besides the two flea-beetles mentioned in connection with *Atropa*, *Epitrix pubescens*, Koch, and *Psylliodes hyoscyami*, L., infest *Hyoscyamus*. The seed-capsules are destroyed by the caterpillars of *Arctia caja* and *Heliothis peltigera*, Schiff., which latter is also a pest of *Senecio*, *Ulex* and *Salvia*. The leaves are mined by the maggots of *Pegomyia hyoscyami*, Pz.

Digitalis.—The stems are infested by the caterpillar of *Gortyna flavago*, Schiff. (*ochracea*, Hb.). The caterpillar of *Tephroclystia linariata*, F., infests the blossoms and capsules of *Digitalis ambigua*, and *Olethreutes lapideana*, H.S., the roots.

Althaea.—A spinning-mite, *Epitetranychus althaeae*, v. H., is found on the leaves; the larva of *Apion radiolus*, Kby., lives in the stems, that of *A. aeneum*, F., occurs in the roots, and that of *A. curvirostre*, Gyll., destroys the seeds. The caterpillar of *Gelechia malvella*, Hb., is another seed pest. Three flea-beetles of the genus *Podagrica*, and the caterpillars of *Carcharodus alceae*, Esp., and of another Lepidopteron, feed on the leaves.

Papaver.—The grub of *Stenocarus fuliginosus*, Mrsh., lives in the roots of poppies, and that of *Ceuthorrhynchus macula-alba*, Hbst., feeds on the seeds in the capsules, in which the larvae of the Cynipids, *Aulax papaveris*, Perris, and *A. minor*, Hart., and of a gall midge, *Perrisia papaveris*, Winn., also live. The leaves are infested by the caterpillars of *Barathra* (*Mamestra*) *brassicae*, L., and *Cnephasia wahlbomiana*, L., and both leaves and stems are attacked by *Aphis rumicis*, L.

Mentha.—The leaves are attacked by the flea-beetles, *Longitarsus waterhousei*, Kutsch., and *L. lycopi*, Foudr., as well as by *Chrysomela coerulans*, Scriba, and *C. coerulans* var. *menthastri*, Suffr. The grubs of two other beetles, *Cassida viridis*, L., and *C. murraea*, L., and a number of caterpillars also infest *Mentha*. Another beetle, *Apion vicinum*, Kby., is found in the stalk, and the closed blossoms harbour the larvae of a gall midge, *Asphondylia menthae*, Pierre. Two other gall midges produce galls on the shoots and leaves.

Verbascum.—A number of beetles, chiefly of the genera *Gymmetron* and *Cionus*, infest the blossoms and leaves. The latter are attacked by three flea-beetles of the genus *Longitarsus* and by 18 species of caterpillars, including *Cucullia verbasci*, L., *C. scrophulariae*, Cap., *C. lychnitis*, Rbr., and *C. thapsiphaga*, Tr. The caterpillar of *Gortyna* [*flavago*] mines the stems, and the closed blossoms are infested by the larvae of the gall midges, *Asphondylia dufouri*, Kieff., *Perrisia* sp., and *Contarinia anthophthora*, F. Löw. A fourth gall midge lives in the thickened inner leaves of the one-year rosettes.

Riba Ferré (J.). **L'Oliver.** [The Olive.]—*Consell Provincial de Foment, Barcelona*, 1920, 98 pp., 38 figs.

A series of lectures on the olive and its cultivation are here issued in pamphlet form.

Pests of the trunk and branches include a Scolytid borer, *Phloeotribus scarabaeoides* (*oleae*), which causes withering of the branches. As this beetle prefers unsound wood it may be trapped by hanging cut branches in the tree in the second half of March ; these must be removed and burned by May. Individuals that have escaped the traps may be killed by a lead arsenate spray. *Saissetia* (*Lecanium*) *oleae* can be combated with a Bordeaux mixture containing 2 per cent. soft-soap and 1 per cent. essence of turpentine, applied from June to October. Another spray for this scale contains 1 part lysol in 100 water, and is applied in May and again early in July. If the effect is unsatisfactory, spraying must be repeated in August and September.

The leaves are attacked at night by *Otiorrhynchus meridionalis*. Spraying with lead arsenate, jarring the tree, or fumigation with carbon bisulphide injected into the ground—where the beetle shelters by day—are the remedies advocated. Another leaf pest is the caterpillar of *Glyphodes* (*Margarodes*) *unionalis* ; it is difficult to combat because it shelters within a case made of leaves ; a lead arsenate spray is usually employed.

The leaves, fruit and branches are infested by *Aspidiotus villosus*, against which fumigation with hydrocyanic acid gas, not later than June, is the best remedy. The winter generation of *Prays oleellus* feeds on the leaves from October to March, the second generation on the ovaries from April to June, and the third on the fruit from July to September. If the ground is properly cultivated, this moth does not appear, because the pupae in the ground are destroyed. This pest may be combated by spraying with arsenicals, lysol, tobacco extract 12° Bé., or nicotine of 93–94 degrees purity. *Psylla oleae* deposits its eggs in the flower-shoots, and its cottony secretion prevents the buds from opening. No satisfactory method of dealing with it has been found.

The fruits are attacked by the olive fly, *Dacus oleae*, against which the usual poison-baits are advised, the system devised by Lotrionte [*R.A.E.*, A, ii, 289, 452] being specially recommended. It is, of course, necessary that the whole district should practise this method if it is to be effective.

GIROLA (C. D.). **El Cultivo del Trigo en la Republica Argentina.** [The Cultivation of Wheat in the Argentine Republic.]—*Anales Soc. Rural Argentina, Buenos Aires*, lv, no. 4, 15th February 1921, pp. 119–147, 8 figs.

The pests of wheat in Argentina include ants, particularly *Atta sexdens*, L.; the grubs of *Diloboderus abderus*, Berg, especially in badly cultivated fields; the army worm, *Cirphis* (*Leucania*) *unipuncta*, Haw.; other Lepidopterous larvae, which in rainy seasons may reduce the crop by 50 per cent.; and a locust, *Schistocerca paranensis*, Burm., which is particularly abundant in the north of the cereal-growing region and causes a great deal of damage.

HEMPEL (A.). **Duas novas Especies de Coccidas.** [Two new Coccids.]—*Rev. Museu Paulista, S. Paulo*, xi, 1919, pp. 451–457, 1 plate.

Eriococcus coffeae from coffee twigs, and *Diaspis flava* from the leaves of a forest tree, are described as new from Brazil.

ZACHER (F.). **Neuzeitliche Schädlingsbekämpfung.** [Modern Methods for Combating Pests.]—*Die Gartenwelt* [*sine loco*], xxv, no. 9 [n.d.], pp. 84–87, 2 figs, 1 plate. [Received 4th April 1921.]

This article describes in a popular manner the latest methods of spraying against insect pests as practised in the United States, and the fumigation processes employed in Germany. In the latter country experiments—with which the author is associated—are being made with containers producing an arsenical cloud, but up to the present the arsenic deposit has been too scanty to be effective. This method requires further study, as it affords great facilities for dealing with tall forest trees.

HEYMONS (R.). **Die Frassfiguren der Hypoborinen.** [The Mine Patterns of Hypoborinae.]—*Zeitschr. wissen. Insektenbiol., Berlin*, xvi, no. 5–6, 15th March 1921, pp. 81–90, 4 figs.

The characters of the mines made by bark-beetles often provide an easier means of identification than examination of the beetles themselves.

This paper deals with the mines of the genera *Hypoborus* and *Liparthrus*, as well as the African genus *Dacryostactus*, of which *D. kolbei*, Schauf., from South-west Africa, is the only species known. Descriptions are given of the mines of *Liparthrum colchicum*, Sem., *L. bartschti*, Mühl, *L. albidum*, Wichm., *L. mori*, Aubé, *Dacryostactus kolbei*, Schauf., and *Hypoborus ficus*, Er. These mines are all characterised by an enlargement of the mother-gallery to a roomy chamber from which the larval mines radiate. In the case of *Liparthrum* and *Dacryostachus* the chambers are lined with niches in which the eggs are deposited singly.

KLEINE (R.). **Der Rapsglanzkäfer,** *Meligethes aeneus*, **F., und die landwirtschaftliche Praxis.** [The Rape Beetle, *M. aeneus*, and Agricultural Practice.]—*Zeitschr. wissen. Insektenbiol., Berlin*, xvi, no. 5–6, 15th March 1921, pp. 90–100.

The author accepts the results of Burkhardt and von Lengerken [*R. A. E*, A, ix, 64], and discusses their suggestions as to the choice of early-flowering varieties of rape.

The problem is to produce varieties that will flower so early that the beetle, when it appears, will find no opening for attack. To do this it is necessary to ascertain the temperature requirements of both plant and beetle, but it is very doubtful whether it is possible to produce plants requiring the little warmth that suffices to cause *Meligethes aeneus* to begin feeding preliminary to mating.

It may be possible to advance flowering by 10–14 days, but this is of no value at all, early flowering being a character of quite secondary importance. Rapidity of blossoming is the important point; the time between the appearance of the bud and the opening of the blossom must be shortened. Even so, success is doubtful because the beetle neglects the open blossom for the bud as long as possible. This habit is chiefly due to weather conditions.

The flowering dates of the common German rape crops are examined, and it is concluded that there appears to be little hope of shortening the bud period. It was found that by ante-dating sowing by 14 days the injury was less marked at first, but that at the end of the vegetative period no advantage at all was gained.

Weather is the most important factor in infestation. Warmth and sunshine promote the growth of the plant and discourage attack, the beetle appearing less ready to seek the shelter of the bud. A high ground temperature also favours the plant. Examination of the losses in 1920 shows that April is the danger month, and plant-breeding experiments must take this into account.

Remedial measures hitherto employed are mostly of a mechanical nature, and have given no result. They may be of some use in small fields, but are not so in cultivation on a large scale, such as is generally practised in Germany. If the average annual loss exceeds 50 per cent. it is necessary to stop growing crops of winter rape. Such areas can only be determined by experiments over a number of years. A change in crop rotation is the only radical measure, or perhaps a summer rape crop may be grown. If the loss does not exceed 25 per cent., combative measures may be taken provided that their cost is found not to be excessive.

Palm (B. T.) & Mjöberg (E.). **Bestrijding van Rupsenvraat in Deli-Tabak. III. Wenken voor Bespuiting met Loodarsenaat-Zeepemulsie.** [Measures against Caterpillar Injury to Tobacco in Deli. III. Advice on Spraying with an Emulsion of Lead Arsenate and Soap.]—*Deli Proefstation, Medan,* Vlugschrift no. 7, February 1921, 3 pp.

The emulsion of lead arsenate and soap applied as advised by the Deli Experiment Station, Sumatra [*R.A.E.*, A, ix, 225], has given good results except in a few cases when scorching occurred, partly owing to lack of uniformity in the quality of the lead arsenate.

It is well to delay spraying as long as possible. Under normal conditions the seedlings should be 25–28 days old. If *Phytophthora* appears, this fungus should be treated with Bordeaux mixture alone, the lead arsenate not being applied until the first signs of caterpillar injury are seen, when the emulsion must be used, either alternately or mixed with Bordeaux. Spraying with lead arsenate must not be repeated at shorter intervals than five days. If screens are used on the beds, they must be entirely removed during spraying and replaced immediately afterwards, as the newly-sprayed plants must not be exposed to full sunshine. The lead arsenate must be dissolved

in water to form a thin paste; this is diluted, and the solution is poured into the sprayer and the soap solution then added. The sprayer must be worked at a uniform pressure, and its contents must be continuously stirred. Any sediment remaining in it must not be emptied on to the seed-beds.

LUIGIONI (P.). **Coleotteri esotici utili e dannosi alle Piante importati in Italia e rinvenuti nel Lazio.** [Exotic Coleoptera, beneficial and injurious to Plants, introduced into Italy and found in the Province of Rome.]—*Atti Pontificia Acad. Nuovi Lincei, Rome,* Sess. I, 19th December 1920. Separate, 4 pp. [Received 10th April 1921.]

The beetles mentioned are a Coccinellid, *Rhizobius lophantae,* Blaisd., imported against the scales, *Aulacaspis pentagona* and *Chrysomphalus aurantii*; a Curculionid, *Pantomorus fulleri,* Horn, probably imported on some exotic plant and reported from various parts of Italy and in 1908 from Sicily, in which citrus-growing region it is hoped that it has not become established; a Bruchid, *Spermophagus subfasciatus,* Boh., evidently introduced in beans imported from Brazil during the War; and a Scolytid, *Coccotrypes dactyliperda,* F. The author has also found the last-named in nuts of *Hyphaene thebaica* (dum palm) from Eritrea, the solid kernel being so damaged as to be useless for vegetable ivory.

MORRILL (A. W.). **The Use of Corn as a Trap Crop for the Cotton Bollworm.**—*Univ. Ariz. Coll. Agric., Tucson,* Circ. 30, March 1920, 10 pp., 2 figs. [Received 7th April 1921.]

The value of maize as a trap crop for the cotton bollworm [*Heliothis obsoleta*] has long been known in Texas and the south-eastern cotton-growing States, and the object of this circular is to bring information on this method before the cotton growers of Arizona, with particular reference to conditions existing in that State. Much of the general information is taken from bulletins issued by the United States Department of Agriculture and previously noticed in this *Review.* As the female moths are attracted to fresh maize-silk rather than to any other material for oviposition, it is generally considered necessary to plant the trap maize so that it will reach the silking stage when the cotton is most in need of protection, though there is evidence that maize maturing at any time during the fruiting season of cotton may protect cotton growing in the immediate vicinity. This is a matter that requires further observation under Arizona conditions, particularly with Egyptian cotton, but from present observation it seems that maize in silk during June and July in Arizona is not likely to do any harm and may be a great benefit to the cotton crop in a neighbouring field. Much valuable information can be gained by noting the amount of bollworm damage close to infested maize in comparison with the damage in the fields furthest from it. A count should also be made of the average number of eggs on the silk of young maize ears. Various observations on the value of maize as a trap crop are recorded, and recommendations for its use are quoted from a bulletin of the United States Department of Agriculture, with suggested adaptations to Arizona conditions.

Gahan (A. B.). U.S. Bur. Ent. **New Reared Parasitic Hymenoptera from the Philippines.**—*Philippine Jl. Sci., Manila*, xvii, no. 4, October 1920, pp. 343–351. [Received 8th April 1921.]

The new species described include the Encyrtids, *Homalotylus mundus*, reared from *Pseudococcus virgatus*, Ckll., and *Taftia saissetiae*, from *Saissetia hemisphaerica*, Targ.; and the Elasmid, *Elasmus albomaculatus*, reared from a moth, *Acrocercops* sp.

Departmental Activities: Entomology.—*Jl. Dept. Agric. Union S. Africa, Pretoria*, ii, no. 3, March 1921, pp. 204–206.

The brown locust [*Locusta pardalina*] in all immature stages is present in great numbers over a large area of the Karoo. These locusts are the descendants of scattered individuals occurring in the area some months previously, which were too widely dispersed to be reached by poison. Those that have gathered into small swarms or clusters are being dealt with energetically, hundreds of drums of poison being hurried to the district by passenger train. White storks are destroying numbers of the locusts. From the Transvaal large numbers of the elegant grasshopper [*Zonocerus elegans*] are reported, while in Basutoland there is an abundance of *Phymateus leprosus*, which has been clearing both vegetable gardens and orchards of their produce.

Aphelinus mali, the parasite of the woolly apple aphis [*Eriosoma lanigerum*], is being established with increasing success. The life-cycle in the field apparently occupies about 21 days in December and January, but in jars in the laboratory 10–13 days was sufficient.

Bollworms are at the present time the most destructive pest of cotton, the rate of infestation, however, being as low as about 5 per cent. Ratooned fields show a higher degree of infestation than first-year fields, some having 25 per cent. of the bolls infected. The Sudan bollworm [*Diparopsis castanea*] in general predominated, and occasionally the American bollworm [*Heliothis obsoleta*]; the spiny bollworm [*Earias insulana*] was less numerous. Improved cultural methods are doing much to keep these insects in check.

Other pests recorded during the month of January were termites; the beetle, *Heteronychus arator*, on maize; in orchards, codling moth [*Cydia pomonella*], pernicious scale [*Aspidiotus perniciosus*], and Cetoniids; and miscellaneous pests of field crops and flower gardens.

van der Merwe (C. P.). **White Ant Notes.**—*Jl. Dept. Agric. Union S. Africa, Pretoria*, ii, no. 3, March 1921, pp. 266–267.

A case of infestation of a house in Durban by the termite, *Schedorhinotermes putorius*, Sjöst., is recorded. This species is fairly common in the neighbourhood and is usually found in hollows of trees, the insects living on the dead wood. In the case in question dead stumps of loquat trees were found about 8 ft. away from the house, and the termites had probably got under the floor by following the dead roots. Possibly a colony originated in the house from a pair of winged adults.

Lounsbury (C. P.). **Citrus Scale Insects.**—*Jl. Dept. Agric. Union S. Africa, Pretoria*, ii, no. 3, March 1921, p. 276.

A list of 23 scale-insects occurring on *Citrus* in the Union of South Africa is given, the most destructive being *Chrysomphalus aurantii*. Most of them are imported species.

Nicholls (H. M.). **Annual Report of the Government Microbiologist.**—*Tasmania Dept. Agric. & Stock, Rept. 1919–20, Hobart,* 1920, pp. 21–25, 1 plate. [Received 12th April 1921.]

A large number of gardens in Launceston have been successfully sprayed with lime-sulphur solution for the suppression of the San José scale [*Aspidiotus perniciosus*]. Although this scale is still distributed over a comparatively wide area, its numbers are greatly reduced. *Aspidiotus ostreaeformis* (oyster-shell scale) has been found to be so widely spread that regulations have been drawn up compelling owners of infested property to take adequate steps for its suppression. Tasmania is at present the only State in the Commonwealth in which it is found, and although it is not likely to prove a menace to well kept commercial orchards, it might cause inter-State complications if fruit were exported from localities where its presence was ignored.

A very serious outbreak of the mussel scale [*Lepidosaphes*] occurred in some districts. Lime-sulphur with a specific gravity of 1·03, or 5° Bé., is advocated as the best measure against this pest. Oil sprays are not reliable under Tasmanian climatic conditions. Special attention should be paid to hawthorn hedges in the vicinity of orchards, as they form a continual source of infection, harbouring both scales and fungous diseases.

The advantages of a calyx spray for the control of codling moth [*Cydia pomonella*] are discussed. Against *Tetranychus bimaculatus* infesting hops and apple trees, lime-sulphur with ordinary flour paste applied at the rate of 1 lb. to 20 gals. of water proved an effective check. The spray should be directed to the underside of the leaves. *Bryobia pratensis* was also abundant owing to the exceptional hot weather. The best time for spraying with lime-sulphur against these leaf mites is just when the leaves are falling or when the leaf buds begin to open in the spring.

Arsenate of Lead.—*Jl. Dept. Agric. S. Australia, Adelaide,* xxiv, no. 6, January 1921, pp. 510–511.

A number of samples of various brands of lead arsenate purchased in Adelaide have been analysed by the South Australian Department of Agriculture, the analyses of ten brands being given.

Weiss (H. B.) & Dickerson (E. L.). *Gargara genistae,* **Fabr., a European Membracid in New Jersey (Homop.).**—*Ent. News Philadelphia, Pa.,* xxxii, no. 4, April 1921, pp. 108–112, 1 fig.

Gargara genistae, F., is recorded on *Caragana arborescens* from New Jersey, and its life-history in that state is briefly described.

Olsen (C. E.). **Two Seasons collecting of Aphidae, principally on Long Island, New York, with Notes on some of the Species.**—*Bull. Brooklyn Ent. Soc.,* xvi, no. 1, February 1921, pp. 14–19.

The Aphids dealt with include:—*Acyrthosiphon* (*Macrosiphum*) *pisi,* Kalt., on *Medicago lupulina* ; *M. rudbeckiae,* Fitch, on *Silene noctiflora, Antennaria neodioica* and *Anaphalis margaritacea* ; *Phorodon inulae,* Pass., on *Inula helenium* ; *Myzus fragaefolii,* Ckll., on *Fragaria virginiana* ; *Hyalopteris arundinis,* F., on *Prunus serotina* ; *Aphis forbesi,* Weed, on *Fragaria virginiana* ; *A. gossypii,* Glov., on

Hisbiscus syriacus; *A. urticae*, F., on *Urtica gracilis*; *A. lutescens*, Mon., on *Asclepias cornuta*; *A. helianthi*, Mon., on *Helianthus rigidus*; *A. sanborni*, Patch, on *Sambucus canadensis*; *Myzocallis discolor*, Mon., on *Quercus prinus*; *Calaphis betulaecolens*, Fitch, and *Euceraphis betulae*, Koch, on *Betula lutea*; *Rhopalosiphum hippophaes*, Kalt., on *Polygonum pennsylvanicum*; and *Pterocomma smithiae*, Mon., on *Salix fragilis*.

Moore (J. G.). **The Vegetable Garden.**—*Wisconsin Univ. Coll. Agric. Extens. Serv.*, Circ. 132, March 1921, 36 pp., 12 figs.

A brief portion of this bulletin is devoted to the prevention and eradication of insect pests. These are tabulated according to the crop attacked, with particulars of damage caused and remedial measures advocated, only the popular names of the insects being given.

Böving (A. G.). U.S. Bur. Ent. **The Larva of** *Popillia japonica*, **Newman, and a closely related undetermined Ruteline Larva. A Systematic and Morphological Study.** — *Proc. Ent. Soc., Washington, D.C.*, xxiii, no. 3, March 1921, pp. 51–62, 2 plates.

The larval characters of the Ruteline group of Scarabaeid beetles are quoted from Schiödte, and the undetermined larva under consideration is stated to be probably that of *Strigoderma arboricola*, F. A key is given for distinguishing North American and European larvae that are closely related to or likely to be mistaken for that of *Popillia japonica*.

Porter (B. A.) & Alden (C. H.). *Anaphoidea conotracheli*, **Girault (Hym.), an Egg Parasite of the Apple Maggot.**—*Proc. Ent. Soc. Washington, D.C.*, xxiii, no. 3, March 1921, pp. 62–63.

The Mymarid, *Anaphoidea conotracheli*, is recorded as parasitising the eggs of *Rhagoletis pomonella*, Walsh, in Connecticut. It has also been reared from *Coeliodes* (*Craponius*) *inaequalis*, Say (grape curculio). The life-cycle in the apple maggot is probably similar to that in the weevil, *i.e.*, 10 to 11 days from egg to adult. The parasitism ranged from 25 to 30 per cent., indicating the possible importance of this parasite in the natural control of *R. pomonella*.

Riley (W. A.). **Division of Entomology and Economic Zoology.**—*28th Ann. Rept. Minnesota Agric. Expt. Sta., 1919–20, Univ. Farm, St. Paul*, 1920, pp. 41–44. [Received 13th April, 1921.]

Experiments with poison baits for cutworms and army worms have shown that the effectiveness of the various formulae depends largely upon the species against which they are used.

Tests in the protection of stored food from insects showed that a temperature of 43° F. prevented the development of *Tribolium confusum*, Duv. (confused flour beetle), which is one of the worst pests. A study of the susceptibility of cereals to insect attack led to the conclusions that the insects that attack sound grain cannot survive in milled products, while those that work in milled products cannot survive in sound grain. Grain that has already been attacked by

grain insects is in a condition comparable with that of milled products, and is subject to attack by the milled product insects. Moist and mouldy products are subject to attack by fungus-eating insects. Each insect seems to have a very definite moisture requirement. The nutritive value of the material may influence the rate of growth and percentage of survival of the insects. The work on nutrition is to be continued.

A study of arsenicals has been made, working on the assumption that leaves of plants when wet exhibit a negative electrical charge, and that the arsenicals used at the present time also exhibit a negative electrical charge. It is believed that if an arsenical could be prepared with a positive electrical charge, greater adherence to the foliage would result. Such material could be prepared either by the addition of electrically positive material, such as ferric hydroxide or aluminium hydroxide, to the ordinary negative reaction, or by the preparation of such arsenicals as ferric arsenate or arsenite or aluminium arsenate or arsenite, with positive charges, thus accomplishing the result directly. A full report of the results will be published shortly.

As regards the spreading of sprays over the leaf surface, the rule seems to hold good that spreading will occur if the surface tension of the leaf is greater than the sum of the surface tension of the spray material plus the surface tension at the interface of the spray and the leaf. On leaves with a thick cuticle excellent results could be obtained by using $\frac{1}{4}$ lb. casein to 100 U.S. gals. of water, the casein being dissolved in a small amount of sodium hydroxide. Gelatine or an alkaline solution of flour used at the same rate can also be employed. On waxy leaves the difficulty of obtaining satisfactory spreading is being overcome by the use of substances that have a decided affinity for the wax of the leaf.

Snapp (O. I.) & Pierce (L.). **Experiments in Dusting and Spraying Peaches for the Control of Curculio, Brown Rot and Scab.**—*Mississippi Agric. Expt. Sta., Agric. Coll.*, Bull. 195, December 1920, 8 pp. [Received 16th April 1921.]

The peach Curculio [*Conotrachelus nenuphar*] was the cause of 50 to 60 per cent. loss among peaches in unsprayed orchards in Mississippi during 1920. A number of spraying tests are recorded in which both dust and liquid mixtures were tried against this weevil, and against brown rot and scab. As regards dusting, the necessity for fineness of materials and for proper and thorough mixing is emphasised, and for this purpose a mechanical sifter and mixer is recommended. Three applications of 10 per cent. lead arsenate dust were effective against the insect, but caused considerable injury to foliage; 5 or 8 per cent. lead arsenate seems to be the highest percentage that can be used with safety, and proved almost as efficient. On the whole it is considered that while dust sprays will probably prove the more efficacious against diseases, liquid sprays give the best result against the weevil. The applications recommended for use on healthy trees on fertile soil are 1 lb. lead arsenate powder to 50 U.S. gals. water, with 5 lb. unslaked lime to be used immediately after the blossoms have fallen; the same spray ten days later; self-boiled lime-sulphur 8 : 8 : 50 with 1 lb. lead arsenate powder about two weeks later; and self-boiled lime-sulphur 8 : 8 : 50 about four weeks before the fruit is expected to ripen.

Ferris (E. B.) **Cotton Growing in South Mississippi.**—*Mississippi Agric. Expt. Sta. Agric. Coll.*, Bull. 196, December 1920, 8 pp. [Received 16th April 1921.]

Until the season of 1920 the Mississippi Station had made no attempt to control the cotton boll weevil [*Anthonomus grandis*] with poisons, but in that year the damage was so great that some growers ploughed up their cotton and planted the land with other crops. On the station farm, in spite of several hand-pickings, many of the cotton stalks had every square punctured. Hand dusting was then begun with calcium arsenate, three applications being given at intervals of about six days. After this treatment the percentage of infestation was so low that poisoning was stopped for a time and begun again in late July, but it is uncertain whether the good results were due to poisoning or to the frequent rains that began about the same time.

Quarantine Regulations adopted by the State Plant Board of Mississippi, March 17, 1920, with Amendment of March 31, 1920: Pink Bollworm Quarantine (effective September 1, 1920).—*Mississippi State Plant Bd., Agric. Coll.*, Circs. 4 & 6, 1920, 2 pp. [Received 16th April 1921.]

By the regulations of March 1920 the importation into Mississippi is forbidden of all cotton lint, cotton seed, etc., and all things or materials used in connection with growing, harvesting, baling or manufacturing cotton lint or cotton seed, from foreign countries, the States of Louisiana and Texas, and from all States in which the pink bollworm, *Platyedra* (*Pectinophora*) *gossypiella*, may hereafter be found to exist, and from all States other than Louisiana and Texas unless accompanied by a special permit from the chief inspector of the State Plant Board of Mississippi giving evidence regarding the point of origin of the material and any other information necessary to establish the safety of such consignment or its freedom from possible infestation by *P. gossypiella*.

These regulations are modified under date 1st September 1920 to refer only to known infested and regulated areas, and certain exceptions to the prohibition order are enumerated.

Importante Decreto para la Extinción de Plagas agrícolas.—*Rev. Agric., San Jacinto, D.F.*, v, no. 7, November 1920, p. 492. [Received 13th April 1921.]

In view of the increasing loss caused by pests and diseases to stock-raising, forestry and agriculture, a decree has been passed by the Mexican Government rendering it obligatory on the part of agriculturists and stock-raisers to notify the Secretary of Agriculture within three days of the presence of any pest in order that remedial measures may be undertaken. These will be prescribed by the Department of Agriculture, and must be carried out within a given limit of time, the Department supplying the requisite materials if judged necessary. Non-compliance with this decree will involve the imposition of a fine.

Ramirez (R.). **Enfermedad en los Naranjos de Turicato, Michoagan.** [A Disease of Oranges in Turicato, Michoagan.]—*Rev. Agric., San Jacinto, D.F.*, v, no. 7, November 1920, p. 547, 1 fig.

Othreis (*Ophideres*) *serpentifera*, Wlk., is a moth that causes considerable damage to oranges in Turicato, Mexico, through the adults

puncturing the rind of the fruit in order to extract the juice. The wound thus made is very small and quickly heals, but the injury is soon followed by the development of a fungus that destroys the flesh of the fruit. It is possible that the fungus simply enters through the puncture or, more probably, that the insect inoculates it when puncturing the fruit.

NOUGARET (A.). **Essais de Destruction de la Cochylis et de l'Eudémis.** [Experiments in the Destruction of *Clysia ambiguella* and *Polychrosis botrana*.]—*Progrés Agric. & Vitic., Montpellier*, lxxv, no. 13, 27th March 1921, pp. 304–309.

A report is given of the remedial measures employed against *Clysia ambiguella* and *Polychrosis botrana* at Lignan. The biology of these moths is described. The treatments included decortication by mechanical means and also by means of chemicals, such as iron sulphate placed in the forks of branches. The usual insecticidal sprays and dusts are recommended; of proprietary liquids those known as Dynamic and Vitarsine are advocated, the former having carbon bisulphide as its basis and the latter arsenic. They may be applied in winter, or in spring and summer if the grapes are well wetted first. The experiments confirm former observations and experiments that have been noticed in this *Review*. As a result of these treatments a normal crop was gathered in 1920 from the treated vineyard, though that of the previous year was almost a total loss.

QUANJER (—). **Considérations nouvelles sur les Maladies de la Pomme de Terre.**—*Bull. Soc. Path. Vég. France, Paris*, vii, no. 4, 1920, pp. 102–118. [Received 12th April 1921.]

The diseases of the potato are reviewed, including mosaic disease and the methods by which it is disseminated. Working on the discovery of Laveran in Algeria, that insects are capable of transmitting this disease, it has been found that it is in plants derived from stock that has been infested with Aphids that the disease almost inevitably occurs. It is proposed to find a resistant stock suitable for propagation in France, which will be reared through several generations in order to ensure against re-infection. Aphids or other insects seldom re-infest plants so cultivated. As Aphids are more abundant in hot regions, varieties of potatoes grown in northern districts will probably prove less susceptible.

MORSE (A. P.). **Manual of the Orthoptera of New England, including the Locusts, Grasshoppers, Crickets, and their Allies.**—*Proc. Boston Soc. Nat. Hist.*, xxxv, no. 6, April 1920, pp. 197–556, 99 figs., 20 pls.

This book is a complete manual to the study of the Orthoptera of New England based partly on the literature, but mainly on the very extensive personal investigations of the author.

The general introduction includes information on the chief literature of the subject; outlines of classification and morphology; injuries by locusts and other Orthoptera in New England; remedies for their control, only the usual formulae being given; natural enemies; and methods of collecting and preserving Orthoptera.

The systematic part of the work includes useful keys for identifying families and species, each species being described with notes on its life-history. The total number of Orthoptera recorded from New England is 132, but no less than 28 do not occur there naturally, being introduced purposely, *e.g.*, *Mantis religiosa*, L., or accidentally, *e.g.*, *Forficula auricularia*, L., several cockroaches including *Pycnoscelus surinamensis*, L., and the European mole-cricket, *Gryllotalpa gryllotalpa*, L. The latter insect has been recorded from the island of Nantucket, but it is not known whether it has become fully established there. Another introduced European Gryllid is *Gryllus domesticus*, L., which is now fairly numerous in certain parts of New England. Of Tettigoniids, *Diestrammena marmorata*, De Haan, is recorded as injurious in greenhouses, while three native species of *Scudderia*—*S. texensis*, Sauss. & Pict., *S. curvicauda*, De G., and *S. furcata*, Br. W. — are possibly injurious when occurring in the vicinity of cranberry bogs. *Nemobius fasciatus*, De G., though not usually considered an injurious cricket, is undoubtedly responsible for a very considerable diminution of food in New England pastures. Five species of tree-crickets are abundant and somewhat injurious, though the damage they do is perhaps offset to a considerable degree by the fact that they destroy Aphids. The snowy tree-cricket (*Oecanthus niveus*, De G.) is the one most often recorded in economic literature as a pest, but many such records apply to other species. It is of economic importance chiefly in neglected orchards, where its punctures during oviposition scar and injure the twigs and provide an entrance for canker and blight. The narrow-winged tree-cricket (*O. angustipennis*, Fitch) is a common insect in apple orchards, but is recorded also on oaks, alders, etc. The dusky tree-cricket (*O. nigricornis*, Wlk.) frequents raspberry and blackberry canes and sometimes injures them severely in ovipositing ; it also oviposits in many other plants. The four-spotted tree-cricket (*O. quadripunctatus*, Beut.) is the most abundant and generally distributed species. It oviposits chiefly in such weeds as golden rod, wild carrot, aster, etc. The pine tree-cricket (*O. pini*, Beut.) is described as being found only in pine trees ; it oviposts in the pith and wood of the smaller twigs of the pitch pine.

The grasshopper of chief economic importance in New England is *Camnula pellucida*, Scudd. ; it is extremely common throughout the northern part of the country and needs but a few favourable dry years to enable it to multiply in such numbers as to render it a formidable pest. Of the genus *Melanoplus*, twelve species are recorded, the commonest being *M. femur-rubrum*, De G., which covers the entire country and is likely to occur in any grassy area or sedge from seashore to mountain top. The destruction caused from time to time in New England by grasshoppers is generally ascribed to this species, though *M. mexicanus atlantis*, Riley, is also very abundant and injurious. Less often, *M. bivittatus*, Say, becomes destructive locally.

Peirson (H. B.). **The Life-history and Control of the Pales Weevil** (*Hylobius pales*).—*Harvard Forest, Petersham, Mass.*, Bull. 3, 1921, 33 pp., 9 figs.

Hylobius pales, Hbst., although a voracious feeder upon the bark of coniferous seedlings, escaped notice as an economic forest pest until 1914. It is a native of the United States and apparently occurs nowhere else except in Canada. Though white pine [*Pinus*

strobus] is the preferred food, a list is given of known food-plants, including species of pine, larch, spruce, fir, junipers, birch and white ash. The adults emerge from hibernation in the soil from late April to late May, and immediately begin feeding near the place of emergence, where they remain until mid-June. At this time they migrate in swarms to some locality where, preferably, a white pine logging operation has recently taken place, to which they are attracted considerable distances by the odour of fresh pitch. Eggs are laid in freshly cut pine logs or in the roots of freshly cut pine stumps, in small perforations in the bark. In log piles, oviposition is generally on the underside of the logs, many eggs being laid close together. When breeding around stumps, the beetles ovipost from a few inches to a foot or more below ground in the roots. The eggs hatch in from ten days to two weeks, and the grubs immediately burrow beneath the bark, of which they loosen large areas. After about two months they are mature, and in early September pupate beneath the bark in individual cells, penetrating about a quarter of an inch into the sapwood. Adults begin to emerge in late September and continue in October. The adults move from one seedling to another, stripping them of their bark, and frequently killing three- or four-year-old seedlings within a very few days. It has been found impossible to maintain a stand of white pine on cut-over areas until three years after cutting, 98 per cent. of damage occurring in the first two years. Moisture is essential to the beetles, and larvae can be killed in infested logs by turning the tunnelled areas to the sun.

The use of repellents, poison baits and banding materials has been tried without much success. There are few natural enemies ; parasites have not as yet been discovered, and the mode of life of the insect protects it from this form of enemy. Birds, especially woodpeckers, feed upon the larvae, but as the beetles feed at night few of them are killed. Moles are probably more useful in feeding on the adults. The fungus, *Sporotrichum globuliferum*, undoubtedly is an important factor in control, especially under moist conditions, which are essential to it, and in which it spreads so rapidly that artificial dissemination is unnecessary.

Infestation that requires dealing with by forest management falls under two heads, namely, that occurring on cut-over areas, and that occurring in pure stands of seedlings such as forest nurseries, plantations and natural reproduction on open pasture land. On cut-over areas, as the beetles are attracted by the odour given off by pine stumps, slashings, etc., it is advised that the slash be piled over the pine stumps and burnt in early spring. This destroys the odour of pitch and also chars the stumps, and thus lowers their attraction for the beetles. Large, adjacent cuttings in consecutive years should be avoided. In plantations, besides burning the slash, all coniferous seedlings on cut-over areas should be eliminated by pulling up and burning them. When the adults emerge and find no food available, they will migrate, and in the following year the plantation could be set out without much risk of infestation. On open land, pasture-grown pines of large size should not be cut when seedlings are present until these are at least $3\frac{1}{2}$ ft. in height. If cut then, the slash should be burnt over the stumps or carted away. Freshly sawn lumber should not be stacked in open pasture where seedlings are present. If possible, such logs should be sawn before the beetles emerge from hibernation in the spring. If this is impossible, the logs should be turned so that the sun's rays may reach the larvae and destroy them.

BRITTON (W. E.). **Twentieth Report of the State Entomologist of Connecticut for 1920.**—*Conn. Agric. Expt. Sta., New Haven,* Bull. 226, 1921, pp. 137–215, 12 plates, 13 figs. [Received 16th April 1921.]

The inspection of nurseries and imported nursery stock during the year is described. Pests intercepted on nursery stock include a bulb mite on Manetti rose from Scotland; *Emphytus cinctus*, L., on roses from England, France and Holland; and woolly aphis [*Eriosoma lanigerum*] on apple from France. Apiary inspection was continued on the same lines as in 1919 [*R. A.E.*, A, viii, 338]. The incidence of European foulbrood has decreased each year since inspection was established, and American foulbrood was much less prevalent than in 1919. The statistics of the inspection of 1920 in 119 towns are shown, arranged by counties.

Extensive tests were made with dust mixtures in comparison with liquid sprays, the general dust formulae consisting of 90 per cent. powdered sulphur to 10 per cent. powdered lead arsenate, with the addition of quantities of nicotine sulphate varying between ½ per cent. and 3 per cent. The liquid spray consisted of one part liquid lime-sulphur to 9 parts water, with ¾ pint nicotine sulphate per 100 U.S. gallons of liquid. The times and manner of the applications are described. In discussing the results, it is pointed out that the tests represent only one season's work in one locality, but it is not considered advisable to discard spraying in favour of dusting, though apparently chewing insects can be fairly satisfactorily controlled by the use of dust. By adding nicotine sulphate to the dust certain sucking insects, such as the false red bug (*Lygidea mendax*, Reut.), seem to be checked, but the data are as yet too meagre to form conclusions. Nicotine greatly increases the expense of the mixture; dusting, on the other hand, requires less time and labour. When sucking insects and scab are troublesome, liquid spraying is considered preferable.

An account is given of *Hemerophila pariana*, Clerck (apple and thorn skeletonizer), the information being based on facts previously recorded. *Agrilus sinuatus*, Ol. (sinuate pear-borer) continues to infest all varieties of pear [*R. A.E.*, A, iv, 446]. The life-history and habits and the characteristic injury are described. It is suggested that all trees that are so badly infested that their value is destroyed should be cut and burnt. In more healthy trees the most severely infested portions may be pruned off and burnt. The pupal chambers of the beetle indicated by sunken and discoloured areas may be cut open, and the insects destroyed. Lead arsenate sprays should be used frequently during the latter half of May and June when the adults are feeding on the leaves. Washes of lime-sulphur and lead arsenate applied to the bark before the beetles emerge might act as a repellent.

As a precaution against the possible introduction of *Pyrausta nubilalis*, Hb. (European corn-borer) into Connecticut, quarantine measures have been passed restricting the importation of all parts or products of maize or other food-plants of the borer without a certificate from the Federal inspector. Both the stalk-borer, *Papaipema nebris*, Gn. (*nitela*, Gn.) and the corn ear worm, *Heliothis obsoleta*, F., are abundant in Connecticut. *Eriocampoides limacina*, Retz. (pear and cherry slug) appears in two generations, eggs of the first being laid in mid-May, and of the second in July and August. It is this latter generation that is most injurious. Spraying with lead arsenate is

the best remedy in nurseries and orchards, but dusting with fresh hellebore, air-slaked lime or fine road dust will suffocate many of the larvae.

The sawfly, *Janus integer*, Nort. (currant stem-girdler), punctures the tender shoots of currant and oviposits in the pith, girdling the shoot above the egg by transverse cuts made with the ovipositor, so that the tips break off or wither. The eggs hatch in about 11 days, and the larva feeds on the pith, excavating a tunnel some inches long. About the beginning of September the mature larva gnaws its way to the bark, where it hibernates, pupating in the following spring and emerging as an adult late in May. The terminal shoots containing the insect should be gathered and burnt in the autumn or early spring, or the girdled canes should be cut back one or two inches in June so that the tips drop to the ground and dry and the newly-hatched larvae in them are destroyed. These measures should be practised thoroughly for a few seasons.

Papilio polyxenes, F. (celery caterpillar, or fennel worm) feeds upon leaves of celery, carrot, parsnip, parsley, fennel and almost any Umbelliferous plants. Eggs are laid on the leaves and hatch in about 10 days. The larvae feed for three or four weeks on the leaves and then pupate suspended from a leaf or other support. After from 9 to 16 days the adults emerge in May and June. There are two generations in the northern States, and at least three in the south. Hand-picking is the best method of control in small gardens. On larger areas spraying or dusting with lead arsenate is effective.

Polychrosis viteana, Clem. (grape-berry moth), is the most serious pest of grapes, webbing the blossom buds and rolling the leaves and later webbing together the berries in a cluster. The sprays recommended are those suggested for Ohio [*R. A.E.*, A, iv, 386], the first application being made just after blossoming, when the berries are about $\frac{1}{8}$ in. in diameter, the second about seven weeks later, or just before the eggs for the second generation are laid, and the third ten days after the cocoons begin to appear on the leaves.

Miscellaneous insects of the year include the bud moth, *Eucosma* (*Tmetocera*) *ocellana*, Schiff., which injured mature apples, and *Eulia pinatubana*, Kearf. (pine tube moth), for which the trees may be sprayed with lead arsenate. Aegeriid borers were troublesome in some localities, *Aegeria* (*Sesia*) *pyri*, Harris, doing considerable damage to apple trees. Apples in orchards that had been experimentally sprayed and dusted, as described above, were found to be gnawed on the surface by *E. ocellana*, by the lesser apple worm, *Enarmonia prunivora*, Walsh, and, more particularly, by the red-banded leaf-roller, *Eulia velutinana*, Wlk. A further late treatment was given to prevent this injury. The juniper scale, *Diaspis carueli*, Targ., was found infesting both red cedar (*Juniperus virginiana*) and a cultivated juniper (*J. pfitzeriana*); if choice ornamental varieties become attacked, several applications should be made between 1st June and 1st September of either kerosene emulsion or nicotine solution and soap in the form of a spray. The elm leaf-miner, *Kaliofenusa ulmi*, Sund., was found infesting elms in one locality; this is the first record of this pest in Connecticut. The European hornet, *Vespa crabro*, L., has been reported as killing and injuring dahlia plants by eating off the bark. The leaf-roller, *Harpipteryx xylostella*, L., another European insect, a description of which is given, was reported as feeding on Tartarian honeysuckle.

Britton (W. E.), Davis (I. W.) & Ashworth (J. T.). **Report of Work in suppressing the Gipsy and Brown-tail Moths. Season of 1919-1920.**—*Conn. Agric. Expt. Sta., New Haven*, Bull. 226, 1921, pp. 151–168, 1 fig.

The methods of dealing with the gipsy moth [*Porthetria dispar*] and the brown-tail moth [*Nygmia phaeorrhoea*] in preceding years [*R. A.E.*, A, viii, 341, etc.] have been continued with satisfactory results. No new towns have been found invested with gipsy-moth, and no trace of it has been found in seven previously infested towns. A watch has been kept for brown-tail webs, but none have been found. The details of suppression work in various towns are given and summarised in a table. A résumé is given of the rearing, colonisation and recovery of the parasites, *Anastatus bifasciatus*, Boy., *Apanteles lacteicolor*, Veir., *Pteromalus egregius*, Forst., *Monodontomerus aereus*, Wlk., *Meteorus versicolor*, Wesm., *Compsilura concinnata*, Meig., and *Sturmia* (*Zygobothria*) *nidicola*, Towns., as well as the predaceous ground beetle, *Calosoma sycophanta*, L. Most of these parasites have become fairly well distributed over the infested portion of the State, and some help may be expected from them in a few years' time. A new quarantine order forbids not only the transportation of nursery stock or forest products from infested to non-infested States, but also from infested to non-infested localities within the same State.

It is believed that *P. dispar* is now well in hand in Connecticut, but the importance of continuing the present work is pointed out, in order to retain the infestation within its present limits, or reduce it if possible.

Zappe (M. P.). **Notes on the Life History of the False Apple Red Bug in Connecticut** (*Lygidea mendax*, **Reut.**).—*Conn. Agric. Expt. Sta., New Haven*, Bull. 226, 1921, pp. 177–179.

Lygidea mendax, Reut. (false apple red bug) caused considerable damage in some of the Connecticut apple orchards in 1920. The eggs are laid in the lenticels of the apple twigs, and hatch when the earliest blossom buds show pink at the tips. The young nymphs crawl to the tip of the twig and puncture the tender leaves, causing them to show reddish spots and curl upward. In the third or fourth instar the nymphs pass on to the fruit to feed. Adults began to appear on 25th June, and by 2nd July most of them had disappeared. Nicotine solution, 1 pint to 100 gals. of water, should be sprayed on the trees just before the blossom buds open, the spray being directed from both sides at once, if possible, as the nymphs readily jump to the opposite side of the leaf to avoid the spray. Nicotine should also be added to later sprays, especially that applied soon after the petals fall.

Zappe (M. P.). **Notes on the Life History of a Sawfly feeding on Austrian Pine** (*Itycorsia zappei*, **Rohw.**).—*Conn. Agric. Expt. Sta., New Haven*, Bull. 226, 1921, pp. 179–182.

The sawfly, *Itycorsia zappei*, Rohw., is recorded on Austrian pines in New Haven. The eggs are laid singly on the needles of new growth in late June and early July. The young larvae spin a loose web around themselves, fastening the outer threads to the needles, and inside this they feed, biting off the needles at their base and devouring them. The six larval instars are described, and Rohwer's description of the adult is quoted.

Zappe (M. P.). **Tests of Soap Sprays to kill the Pink and Green Potato Aphid** (*Macrosiphum solanifolii*, **Ashmead**).—*Conn. Agric. Expt. Sta., New Haven*, Bull. 226, 1921, pp. 182–183.

Macrosiphum solanifolii, Ashm. (pink and green potato aphis) has been rather numerous and injurious around New Haven for the last three or four years. Owing to the high cost of nicotine solution, potato fields were sprayed in 1920 with water containing only soft soap of a kind used for washing automobiles. This soap was made with a basis of linseed oil and contained only 56·2 per cent. water. Used at the rate of ½ oz. per U.S. gal. of water, it killed all Aphids on dipped potato plants, and gave very good results in sprayed fields.

Garman (P.). **The European Red Mite, a new Orchard Pest in Connecticut** (*Paratetranychus pilosus*, **Can. & Fanz.**).—*Conn. Agric. Expt. Sta., New Haven*, Bull. 226, 1921, pp. 184–189, 1 fig.

Apple orchards in Connecticut were found in early July 1920 to be badly infested with *Paratetranychus pilosus* (European red mite), which has apparently been present in Connecticut for at least three years. The winter is passed in the egg-stage on the twigs, generally in bud-scars or in crevices in the bark, or in the calyx cavity of apples. Hatching occurs in the spring, the greatest development taking place between May and August, and the chief damage being done in June. All stages may be found on the leaves at the same time. The stages are described. The results of infestation are partial defoliation and a reduction in the size of the fruit. An investigation into the sprays used showed that the delayed dormant spray is important as a remedy for the mite and should not be diluted more than 1 : 9 in the case of lime-sulphur. The usual treatments for red spiders, such as sulphur dust, lime-sulphur 1 : 50, kerosene emulsion and scalecide, might be used with advantage. In Oregon a combination of nicotine sulphate and lime-sulphur or scalecide has been found very effective. It is thought that the eggs are not killed by winter-strength lime-sulphur, but observations on the citrus mite indicate that the continued action finally kills a large percentage of the mites after hatching. Tables show the results of tests with various insecticides.

Heinrich (C.). **Some Lepidoptera likely to be confused with the Pink Bollworm.**—*Jl. Agric. Res., Washington, D.C.*, xx, no. 11, 1st March 1921, pp. 807–836, 17 plates.

The characters by which the larva and pupa of *Platyedra* (*Pectinophora*) *gossypiella*, Saund., may be distinguished from those of other Lepidoptera attacking cotton or related malvaceous plants, as well as those feeding on other plants in the vicinity of cotton fields, are described. A key to the larval characters is also given. The 38 species dealt with include the Stenomid, *Aedemoses hesitans*, Wlsm., on Mexican ebony (*Siderocarpus flexicaulis*); the Olethreutid, *Crocidosema plebeiana*, Z., on *Malvastrum spicatum*, hollyhock (*Althaea rosea*), *Malvaviscus drummondi*, okra (*Hibiscus esculentus*), in seed pods of *H. militaris* and in flowers of *H. rosa-sinensis*; the Pyralid, *Glyphodes pyloalis*, Wlk., on leaves of a mulberry tree, all of which are recorded for the first time from the United States; and a Lycaenid, *Strymon melinus*, Hb., which feeds on practically all the Malvaceae.

The new species described include:—the Gelechiids, *Gelechia neotrophella* on *Mimosa berlandieri*, and *Telphusa mariona* on *Abutilon* spp., *Malvastrum* sp., and other plants, and the Blastobasid, *Holcocera confamulella* on fruits of *Crataegus*.

Ainslie (G. G.) & Cartwright (W. B.). **Biology of the Smartweed Borer, *Pyrausta ainsliei*, Heinrich.**—*Jl. Agric. Res., Washington, D.C.*, xx, no. 11, 1st March 1921, pp. 837–844.

Studies carried out in Tennessee and the neighbouring States indicate that *Pyrausta ainsliei*, Heinr., is of no importance as a pest. Its chief food-plant is *Polygonum pennsylvanicum*, with which the distribution of this moth is probably coextensive. It is easily confused with *P. nubilalis*, Hb., and *P. penitalis*, Grote [*R. A.E.*, A, viii, 116]. The life-history is described. There are two generations a year; the larvae of the second generation are fully grown and abandon the food-plant about the end of August. They seek shelter for the winter in various plants, including maize. The essentials of the shelter-plant are pithy stems with a bark that is not too dense for the larva to enter. Feeding does not take place in the winter quarters.

Over 40 per cent. of the larvae were parasitised by *Panzeria* (*Pyraustomyia*) *penitalis*, and the other three Tachinid parasites recorded from *Pyrausta penitalis* [*R. A.E.*, A, vii, 117] also possibly attack *P. ainsliei*. The larva of a beetle, *Calleida decora*, F., has been found preying on the larvae of *P. ainsliei*, and those of *Chauliognathus pennsylvanicus*, De G., are also found in the burrows of the borer as well as Forficulids, though the latter probably only act as scavengers.

de Ong (E. R.). **Prevention and Control of Insects in Dried Fruits.**—*Mthly. Bull. Cal. State Dept. Agric., Sacramento*, x, no. 2, February 1921, pp. 72–74.

The importance of protecting dried fruit from insect infestation is emphasised and preventive measures are discussed [*cf. R. A.E.*, A, vi, 425; vii, 358]. The measures advocated include cold storage, exposure to a temperature of 32° to 36° F. for two or three months having proved successful against all the insects experimented on.

Strong (L. A.). **Quarantine Service. Reports for the Months of January and February, 1921.**—*Mthly. Bull. California Dept. Agric., Sacramento*, x, nos. 1 & 3, January & March 1921, pp. 50–52 & 120–122.

The pests intercepted during January and February were:—From South America, *Ephestia* sp., in cacao beans. From Canal Zone, *Cathartus gemellatus* and *Calandra* (*Sitophilus*) *linearis* in maize; *Lepidosaphes beckii* on oranges; and *Parlatoria zizyphus*, *Lepidosaphes beckii* and undetermined Coccids on lemons. From Central America, *Pseudococcus* sp., *Aspidiotus* sp., *A. cyanophylli*, *Chrysomphalus aonidum* and *Icerya purchasi* on bananas; and pupae of *Pieris* (*Pontia*) *rapae* in banana cars. From Mexico, *Heliothis* (*Chloridea*) *obsoleta* in tomatos; *Calandra* sp. in garvanzos; *Chrysomphalus aonidum* on coconuts; *Aspidiotus* sp. on *Achras sapota*; *Pseudococcus* sp. on pineapples; and *Chrysomphalus aurantii* on oranges. From Oregon, *Aspidiotus perniciosus* and *Cydia* (*Laspeyresia*) *pomonella* on apples. From Texas, *Aegeria exitiosa* in peach stock; and *Chrysomphalus*

aurantii on Florida grapefruit. From Washington, *A. perniciosus* and *C. pomonella* on apples. From Florida, *Lepidosaphes beckii* on pomelos; and *Aspidiotus* sp. on oranges, grapefruit, tangerines, and green coconuts. From Illinois, *C. pomonella* and *A. perniciosus* on apples; and *Lepidosaphes beckii* on Florida grapefruit. From New Hampshire, *A. perniciosus, Lepidosaphes ulmi* and *C. pomonella* on apples. From New York, *A. perniciosus* on apples. From Pennsylvania, *A. perniciosus, L. ulmi* and *C. pomonella* on apples; and *Aphis rosarum* on rose plants. From Louisiana, *L. beckii* on oranges. From Nevada, *Heterodera radicicola* in potatoes. From Oklahoma, *Parlatoria pergandei* on Texas grapefruit, oranges and lemons. From Kansas, *Aegeria exitiosa* in peach stock. From Hawaii, *Pseudococcus* sp. on avocado and pomegranate; a Trypetid in tomatos; *Diaspis bromeliae* and *Pseudococcus bromeliae* on pineapples and bananas; *Aspidiotus cydoniae, Pseudococcus* sp., *Prenolepis* sp., *Hemichionaspis minor, Ripersia palmarum, Chionaspis inday* and *Chrysomphalus aonidum* on coconuts; *Coccus elongatus*, Lepidopterous pupae and *Aphis* sp. on betel leaves; *Howardia biclavis* and *Saissetia nigra* on *Hibiscus*; *Ischnaspis longirostris* on *Gardenia*; *Lepidosaphes crotonis* on croton; *Hemichionaspis* sp. on *Dracaena*; larvae of *Ceratitis capitata* in coffee berries; and *Coccus elongatus, C. mangiferae* and *Chionaspis* sp. on mango plant. From Tahiti, undetermined Coccids on limes. From China, Lepidopterous larvae in dried herbs, peanuts and beans; and *Calandra oryzae* in rice-hull packing. From Japan, *Pseudaonidia duplex, Pseudococcus* sp., case-bearers, mites, *Cremastogaster* sp. and larvae and pupae of Lepidoptera on *Azalea*; *Hemichionaspis aspidistrae* and *Chrysomphalus aonidum* on *Aspidistra*; *Cathartus advena* and Curculionid larvae in pine nuts; and *Aulacaspis pentagona* on *Pyrus* sp. From Italy, *Lepidosaphes beckii, Parlatoria* sp. and *Pseudococcus* sp. on lemons.

FRANK (A.). **Spring Spraying Program for 1921.**—*Mthly. Bull. Western Washington Expt. Sta., Puyallup*, viii, no. 12, March 1921, pp. 182–186.

Recommendations are made for spraying against various insect pests of fruit trees. Those dealt with include codling moth [*Cydia pomonella*], bud moth [*Eucosma ocellana*], tussock moth [*Hemerocampa*], tent caterpillars [*Malacosoma*], Aphids, scale-insects, etc.

DUPORT (L.). **Rapport sur les Recherches poursuivies à la Station Entomologique de Cho-Ganh.**—*Supplements to Bulls. 125 & 126, Chambre d' Agric. Tonkin and Nord-Annam, Hanoi*, nos. 7 & 8, January–February & March–April 1920, 7 pp. [Received 20th April 1921.]

Records are given of the insectary work during the winter months in connection with the Braconid parasitic on *Xylotrechus quadripes* (coffee borer) and *Chlorophorus annularis*, Fairm. (bamboo borer), already noticed [*R.A.E.*, A, viii, 220, ix, 95.]

ILLINGWORTH (J. F.). **Cane Grub Investigation.**—*Queensland Agric. Jl., Brisbane*, xv, pt. 3, March 1921, pp. 128–130.

Observations on the oviposition of cane grubs [*Lepidiota*] are described. Hand collection of gravid females from the sugar-cane leaves between 5 and 8 a.m. is advocated, but the collection of adults from the feeding trees, especially if done more than two weeks after

the primary emergence, has proved useless. Asilids are effective natural enemies, and a bug, *Amyotea hamata,* might prove useful as a predator were it present in greater numbers.

TROOP (J.). **Entomology.**—*32nd Ann. Rept. 1918–19, Purdue Univ. Agric. Expt. Sta., Lafayette, Ind.,* pp. 33–36. [Received 21st April 1921.]

The study of the life-history of *Cydia* (*Carpocapsa*) *pomonella* (codling moth) under Indiana conditions has been continued. There is apparently no maximum time of emergence, but the moths appear steadily from 15th June to 15th August. During hot weather the larvae may hatch in 6 to 8 days after the emergence of the adult. To prevent infestation the apples should be kept covered with poisons from the time the blossoms fall until the end of August.

The wheat joint worm [*Harmolita tritici*] has caused even more injury to wheat than *Mayetiola destructor.* Rotation of crops, ploughing under of stubble, etc., are measures advocated for the control of this pest. Only one brood of the wheat midge [*Contarinia tritici*] is injurious to the crop, and it may be controlled by autumn ploughing.

Grasshoppers were successfully controlled by the use of the hopper-dozer, and where this means could not be applied, poison baits were used. Ground oats and barley or even sawdust proved an effective substitute for wheat bran in poison baits. Army worms were more abundant than usual, but were heavily parasitised and a repetition of the outbreak is not expected.

The seventeen year Cicada [*Tibicen septemdecim*] caused serious injury to young fruit trees in sod in certain areas.

TROOP (J.). **Entomology.**—*33rd Ann. Rept. 1919–20, Purdue Univ. Agric. Expt. Sta., Lafayette, Ind.,* pp. 22–23, 2 figs. [Received 21st April 1921.]

As a result of further investigations into the life-history of the codling moth [*Cydia pomonella*], it has been found that there are no well defined broods and practically no break from the time of the emergence of the first moths in May to the last in September. These data will necessitate a revision of the existing spray schedules.

LARRIMER (W. H.). **The Hessian Fly in Indiana.**—*Purdue Univ. Agric. Expt. Sta., Lafayette, Ind.,* Circ. 95, May 1920, 8 pp., 5 figs. [Received 21st April 1921.]

The Hessian fly [*Mayetiola destructor*] has two generations in Indiana. Its life-history in that State is described. Remedial measures include the usual cultural methods, and the determination of a safe date for sowing. Experiments have been conducted along these lines, and a chart is given showing the dates for various districts. As these dates must vary according to weather conditions and fly prevalence, the necessary information will be given out far enough in advance for farmers in the affected localities to modify their plans accordingly.

PRICE (W. A.). **Bees and their Relation to Arsenical Sprays at Blossoming Time.**—*Purdue Univ. Agric. Expt. Sta., Lafayette, Ind.,* Bull. 247, July 1920, 15 pp., 7 figs. [Received 21st April 1921.]

An almost imperceptible amount of arsenic is fatal to bees, and observations have shown that they will work freely on sprayed trees although surrounded by unsprayed ones. For these reasons fruit trees should not be sprayed while in full bloom.

FROGGATT (W. W.). **Ladybird Beetles and Potatoes.**—*Agric. Gaz. N.S.W., Sydney*, xxxii, pt. 3, March 1921, p. 196.

Epilachna vigintioctopunctata is said to be one of the most useful Aphid-destroying Coccinellids in Australia, but it also feeds not infrequently on potatoes and causes serious damage when numerous.

LEEFMANS (S.). **De Palmsnuitkever** (*Rhynchophorus ferrugineus*, **Oliv.**). [The Palm Weevil, *R. ferrugineus.*]—*Meded. Inst. Plantenziekten, Buitenzorg*, no. 43, 1920, 90 pp., 11 plates, 1 map. (With an English Summary.) [Received 12th April 1921.]

These are the first original investigations published in the Dutch East Indies on the coconut palm weevil, *Rhynchophorus ferrugineus*, Oliv. The work was conducted concurrently with that on the rhinoceros beetle, *Oryctes rhinoceros*, L., first at Buitenzorg, Java, and then at Padang, Sumatra. [*R.A.E.*, A, ix, 45].

In Java the typical *R. ferrugineus* (red palm weevil) of British India occurs, but in addition there is a black variety with a longitudinal red or orange mark on the pronotum, known as *R. ferrugineus* var. *schach*, Oliv.; this is unknown in British India. In Sumatra and Borneo both this and other varieties occur. In the Batjan Islands, West and South New Guinea and Celebes *R. papuanus*, Kirsch, is found and is evidently the representative in the Australian region. In Celebes *R. ferrugineus* and *R. ferrugineus* var. *schach* occur in addition. It may be noted that both these are found in the Philippines, though there the variety is called *R. pascha*, Boh. Crossing experiments between the Javanese (*R. ferrugineus* type) and Sumatran (*R. ferrugineus* var. *schach*) forms showed that the former is heterozygous and the latter homozygous. A curious result of this crossing was the appearance of grubs with visible rudimentary legs and chitinous processes on the mesothorax and metathorax.

To test the accepted theory that the coconut weevil makes use of the holes made by the rhinoceros beetle, many dying palms were felled and examined. In 17 cases traces of *Oryctes rhinoceros* only were present; in 8 cases (6 of which were young palms) traces of *Rhynchophorus* only; in 48 cases traces of both pests; and in 4 cases traces of neither. It is thus possible for coconut palms to be killed by either, but as a rule both are concerned, and therefore the measures taken against *Oryctes* are useful against *Rhynchophorus*. The fact that coconuts, especially between 4 and 10 years in age, can be destroyed by the latter quite independently of the former is important, and it may be said that the injury due to the weevil is the more serious. As *Rhynchophorus* also attacks ornamental palms (*Livistona*, etc.) and species of economic value (sago, etc.) its importance as a pest is evident. The larva alone is injurious. In old coconuts the crown is infested, sometimes in conjunction with *Oryctes*. In young palms the crown, the trunk, and the root-collar may be affected. Infestation of the crown in both old and young palms is characterised by the dropping of the young heart leaves; it is nearly always fatal. Felling reveals the internal injury to the trunk, which must be destroyed together with the pests it harbours. The trunk infestation and the root-collar infestation found in young palms are revealed by the wounds in the trunk from which debris is extruded or by a small hole from which a brown fluid flows. If these signs are noticed early enough it is possible to cure the trouble by removing the larva or killing it *in situ*.

The eggs are laid in the wounds, and the egg-stage lasts exactly three days. The larva was found in the following palms :—*Metroxylon sagus*, *Arenga saccharifera*, *Elaeis guineensis*, and *Corypha gebanga*, and in addition has been recorded in *Phoenix sylvestris* and *Borassus flabellifer*. Another breeding-place is the rubbish from the native sago manufacture. The larvae like moist surroundings and are not drowned by 48 hours' submersion. The damage done by a few individuals is astonishing. The greatest number found in a coconut palm was 42 ; in a dead sago palm 155 larvae, pupae and adults were observed. The shortest larval period in the laboratory was three and a half months. Under conditions approximating to those in nature the shortest period was two months. There is an inactive larval stage in the cocoon. This lasts 3–5 days and is followed by a pupal stage of 13–15 days. After emergence from the pupa, the weevil remains for 11–18 days in the cocoon. The first eggs were laid 11–21 days after emergence. Trapping gave an average proportion of 60 males to 40 females. Experiments with marked weevils showed that they can detect favourable breeding-places at 1,000 yards distance. A greater distance is quite probable, and the fifty-yard estimate found in the literature is quite inadequate. The maximum number of eggs obtained from one female was 531. Up to 87 per cent. of the eggs produced larvae. The longest period of adult life in captivity was 107 days. The shortest life-cycle was three months, at sea-level (Padang), and the longest seven months, at 780 feet (Buitenzorg) under unfavourable conditions. Four annual generations are therefore possible.

The American palm weevil [*Rhynchophorus palmarum*] in Trinidad is said to be attracted by the soft tissue of palms. The author had observed that fresh cut trunks of the sago palm strongly attracted *R. ferrugineus*, and experiments were made on the trapping value of this easily obtained material. Two days after felling, the fresh sago trunks become attractive and remain so for 10–13 days. Pieces of trunk from a palm that had already flowered remained attractive for a month. As a tree dies after bearing fruit, it is worthless except for such traps. The weevils fly by day, rarely at night or in the dusk. Both sexes were attracted, the females averaging 40 per cent. of the catches. During the experiments 501 weevils were captured in seven experiments, a whole sago palm trunk being cut up and used in each. As one female may lay over 500 eggs, it is obvious that this trapping is advisable wherever the sago trunks have little value. The placing of cages containing males with the trap trunks resulted in a higher number of captured weevils, males as well as females.

The trunk of a young coconut palm (4–6 years old), cut into six pieces, served to attract the weevils for two days only. A number of other experiments were made with baits. Coconut water from ripe or nearly ripe nuts, ordinary alcohol, coconut toddy, acetic acid, and other substances gave no results. Decaying sugar-cane was of some use, but very much inferior to sago trunks.

In experiments on the manner in which the weevils enter the palms it was found that infestation was not effected on the healthy cortex of young or old palms. Eggs are only laid in wounds, including those a month old. In old trees with hard tissues the larvae never developed ; in young trees development was normal, and the trees were badly damaged or died. Infestation in steps cut for climbing the palms had fatal results in *young* trees. Infestation in fresh leaf scars failed.

In the stumps of cut-off leaf-stalks eggs were laid and larvae developed to some extent, but they never reached the trunk. Observations in the field confirm the above results.

There were signs that other beetles besides *O. rhinoceros* probably act as intermediaries for infestation by *R. ferrugineus*. The suspected species are *Platypus solidus*, Wlk., which makes small holes in the bark; *Trochorrhopalus strangulatus*, Gyl., found in numbers in holes probably made by this beetle in the cortex of young palms; and *Diocalandra* sp.? the larvae of which live in the roots of coconut palms.

No parasites of *R. ferrugineus* were found. On one occasion Nematodes were found in the intestines of some weevils, but attempts to infest others failed. Insect-eating birds and mammals are of little importance.

Preventive measures include all those advocated against *O. rhinoceros* [*loc. cit.*]. Wounds in the cortex of young trees (under 10–13 years of age) are dangerous. When cutting the leaf-stalk at least 12 inches must be left on the trunk. Old leaves and flower spikes must not be *pulled* off. The tender parts of the crowns must not be crushed, if and when the crowns are cleaned. Accidental wounds must be tarred promptly and repeatedly. Small Curculionid beetles that might gather in crevices or holes must be regularly collected. To prevent the root infestation of young trees, the roots must be kept covered with soil and protected against injury. All possible breeding-places, such as dead palms, must be cut and buried under eight inches of soil.

Remedial measures include trapping the weevils in cut sago trunks, collection thrice a day being necessary; collection of the weevils found when cleaning the crowns; and supervision of plantations by trained beetle-catchers who can detect signs of infestation. Infestation of the crown is almost incurable. Trunk and root infestation may be cured by injecting carbon bisulphide into the bore-hole, which is then plugged with clay for 24 hours. Afterwards the affected tissues and the dead larvae are removed and the cleansed healthy tissues are tarred several times, the hole being finally closed with cement. One application of tar is insufficient.

LEEFMANS (S.). **Een uit Amerika geimporteerde Plaag van de Agavecultuur** (*Scyphophorus acupunctatus*, **Gylh.**). [*S. acupunctatus*, a Pest of Agave imported [into Java] from America.]—*Meded. Inst. Plantenziekten, Buitenzorg*, no. 44, 1920, 7 pp. 2 plates. [Received 12th April 1921.]

In 1916 complaints were received from an estate in East Java that Curculionid larvae were infesting the slips of *Agave sisalana*, especially in the nursery beds. The pest was identified as *Scyphophorus acupunctatus*, Gyl., a weevil occurring in California, Colorado, Texas and Haiti, and infesting Amaryllidaceae such as *Agave* and *Fourcroya*, and Liliaceae such as *Yucca*.

The larvae bore into the tissues and kill the plant. The slips and the old stems are chiefly attacked, the latter being important breeding-places that must be destroyed.

Descriptions of the larva, pupa, cocoon and weevil are given.

It is advisable that the advice of the Instituut voor Plantenziekten be sought before importing slips from East Java or from Sumatra, to which island slips from East Java appear to have been sent. Any occurrence of the pest should be reported without delay.

Bally (W.). **Verslag van het Proefstation Midden-Java over het Jaar 1920.** [Report for 1920 of the Central Java Experiment Station.]—*Meded. Proefst. Mid.-Java, Salatiga,* no. 36, 1921, 24 pp.

A twig-borer appeared in numbers on some coffee estates. The dangerous coffee bean-borer, *Stephanoderes hampei*, remained restricted to one estate, Central Java being otherwise free from it.

Cases of injury to *Hevea* by borers were rather numerous. In one locality a small species of *Xyleborus* was found in healthy trees that had never been tapped. It was observed that such covering preparations as tar, etc., attract borers to some extent, and tap-wounds covered with paraffin preparations have been attacked by borers on several occasions.

Gaudot (G.). **Les Sauterelles en Camargue.**—*Jl. Agric. Pratique, Paris,* xxxv, no. 15, 16th April 1921, p. 300.

In view of the damage caused by African locusts in several localities of the Bouches-du-Rhône district, a decree has been passed compelling the application of remedial measures. The terms of the decree are quoted and necessitate the determination and clear marking of breeding areas, and a careful look out for the emergence of the young hoppers from 1st March to 31st May 1921. As the eggs hatch the responsibility for the destruction of the insects rests on the occupier of the land infested, who must inform the proper authority. Should the destruction not be completed within 48 hours, operations will be carried out at the occupier's expense. The remedial measures suggested include insecticides such as cresyl solution, coal tar oil and chlorpicrin, flamethrowers and poison baits.

Leone (G.). **La Distruzione dell'** *Icerya purchasi* **nelle Oasi di Tripoli.** [The Destruction of *I. purchasi* in the Oases of Tripoli.]—*L' Agric. Colon., Florence,* xv, no. 3, March 1921, pp. 140–141.

In order to combat the Coccid, *Icerya purchasi*, which has been ravaging the *Citrus* trees in the oases of Tripoli, the author obtained with the help of the Portici Entomological Station about 100 specimens of the Coccinellid, *Novius cardinalis*. In a few months the success of this measure became so marked that the natives are themselves assisting in the spread of this beneficial ladybird.

Ritzema Bos (J.). **Mijn Proefveldje bij het Instituut voor Phytopathologie van 1906 to 1920.** [My Experimental Plot at the Institute of Phytopathology from 1906 to 1920.]—*Tijdschr. Plantenziekten, Wageningen,* xxvii, no. 3, March 1921, pp. 29–44.

One of the observations made showed that with adequate manuring winter rye was successfully grown for 14 consecutive years in the same field without infestation by pests. The freedom from infestation must be due to the absence of pests at the beginning of the period, and this refutes the author's former opinion that *Tylenchus devastatrix* and *Heterodera schachtii* are present in some number in all soils and that a succession of the same crop leads to their increase.

TRÄGÅRDH (I.). **Undersökningar över den större Märgborren, dess Skadegörelse och Bekämpande.** [Investigations on *Myelophilus piniperda*, its Injury and Control.]—*Medd. Stat. Skogsförsöksanst., Stockholm*, xviii, no. 1, 1921, pp. 1–80, 27 figs. [With a Summary in German.]

Owing to thinning methods increasingly employed in Sweden during the past 10 years, *Myelophilus piniperda* has become more abundant in forests.

Experiment has shown that this bark-beetle has only one annual generation; under certain undetermined circumstances it is able to produce a second brood which is of no practical importance owing to its rare occurrence and small numbers. In Southern and Central Sweden, up to 64° north latitude, swarming takes place at the end of May or early in June.

The injury done at the beginning and in the middle of June is at first difficult to detect; the affected needles are distinguishable only by the fact that they are shorter. The shoots then resemble those injured by the pine shoot moth [*Rhyacionia buoliana*], except that in the latter case the openings surrounded by resin are missing. Dry shoots still on the branch are often infested by larvae of *Anobium* sp., but this beetle is never a primary pest. If the shoot is so vigorous that the outer woody portion is not destroyed, the injured part is healed by the formation of a callosity, though growth remains checked during the year first following. The crowns are attacked in spring by beetles that have not matured in the previous years. This injury is less severe than that in June caused by individuals that have produced the new brood and are preparing to produce a second one, or than that in July due to the new brood. The rare occurrence of the second brood just mentioned has not been explained, but it may be due to the lack of suitable trees for the breeding of this second generation. It thus seems that feeding after the production of the annual brood aims at forming a reserve brood able to utilise any breeding facilities that may appear in late summer.

The top of the crown is the part most attacked, probably because *M. piniperda* prefers the same year's or the previous year's shoots to older ones. Injury due to a single attack may be made good by new shoots, but nevertheless gives rise to loss, and it has been estimated by a competent authority that in extreme cases the increase in diameter of the tree may be lessened by 22 per cent. Figures are given showing that a 10 per cent. reduction entails a loss of about 1,600,000 cubic feet of timber in Sweden. It is very seldom, however, that trees in a plantation of young pines are killed as the result of one attack. The injury to the trunk as a result of mining for breeding purposes varies in importance. If the mines are numerous the tree may be killed; if their number is small it is possible that the tree may escape infestation in the following year. In an experimental plot 6 per cent. of the trees were killed and 6 per cent. were fatally injured in the course of two years as a result of the winter feeding. As the latter occurs as frequently as the injury to the crowns, its importance appears to have been overlooked hitherto. More attention should be paid to this phase of the activity of *M. piniperda*.

If the trees felled in a thinned area are left lying in the forest the crown infestation spreads throughout it, but if the felled trunks are placed along a road most of the fresh injury is confined to the trees alongside, indicating that *M. piniperda* seeks trees that are close

to its breeding places. During the summer of 1920 the author found that *Pissodes* spp. and *Magdalis* spp., when feeding, usually collect near the places where they will oviposit later on; in pine woods they are found in numbers near winter-felled timber. It is probable that *Myelophilus piniperda*, the life-history of which is very similar to that of these beetles, behaves in a like manner. This would also explain a concentration of crown injury independently of the occurrence or non-occurrence of breeding facilities.

The occurrence of *M. piniperda* is in close relation to modern methods of thinning, which multiply breeding facilities. In forests that have not been thinned the pest is much less abundant, and only weakened, backward trees are infested and not even all of them. If such trees are available after *M. piniperda* has swarmed, they are infested by *Pissodes pini* and by Longicorns. In a forest where thinning has been neglected, *M. piniperda, P. pini* and Longicorns are all found. Not only weak trees but those broken by snow are infested; the injuries in both categories do not, however, result in much loss, though if many such trees are present there is an increased number of beetles, and these may prove a danger if thinning or felling is begun.

The size of the felled trees influences the occurrence of *M. piniperda.* Stems with a diameter of or under $3\frac{1}{2}$ cm. may be left lying without risk and indeed with advantage because very few of the eggs (0·5 per cent.) laid in them develop. Trees felled in summer and autumn have undergone such changes by the spring as to be unattractive. In exposed situations the changes are so rapid that clearing may be continued up to November. In shaded places clearing must cease by the end of August. It is possible that the non-dangerous period may be extended by barking the trunks.

Leonardi (G.). **Monografia delle Cocciniglie Italiane. Opera postuma. Edizione curata e accresciuta di un'Appendice dal Prof. F. Silvestri.** [A Monograph on Italian Coccidae.]—*Portici*, 1920, vii + 555 pp., 375 figs. [Received 25th April 1921.]

The author completed this important monograph just before his death, from material collected during a lifetime's work on the Coccidae of Italy. The volume is edited, by the author's wish, by Prof. Silvestri.

A general section describes the development and metamorphosis of Coccids, their economic importance, natural enemies, and the measures employed against them. A glossary of the terms used in the nomenclature of their external anatomy is included in this portion of the work.

The bulk of the volume is devoted to the description of 50 genera and 147 species, much of the material having appeared before in the form of scattered papers. Most of the numerous figures are original. There is a key to the subfamilies, many specific keys, and full references to the names adopted and to the synonymy. The author has in some cases disregarded the commonly accepted rules of nomenclature, the subfamily name, Hemicoccinae being used though there is no genus *Hemicoccus*, and the only included genus being *Kermococcus*, a name that is substituted for *Kermes* owing to its resemblance to the Aphid genus, *Chermes*.

Much of the information available on the Coccidae of Europe is contained in this volume, which will be of considerable assistance to students of this group.

Mjöberg (E.). **Results of Dr. E. Mjöberg's Swedish Scientific Expeditions to Australia, 1910-1913 : 19. Isoptera.**—*Ark. Zool., Stockholm*, xii, no. 15, 1920, 128 pp., 6 plates, 64 figs. [Received 25th April 1921.]

Most of the termites dealt with come from the dry desert-like country in the Kimberley district of North-west Australia and from the rain-forests of Queensland. No less than 51 species belonging to 12 genera were collected in Australia; of these 36 species and 1 genus proved to be new.

Parfentjev (I.). **Les Insectes nuisibles aux Plantes Médicinales en Crimée.**—*Bull. Soc. Path. Exot., Paris*, xiv, no. 3, 9th March 1921, pp. 164–167, 5 figs.

A good deal of interest was aroused in medicinal plants in Russia during the War on account of the difficulty of importing drugs, and they were largely cultivated both by the Government and by private enterprise.

The insect pests injurious to these plants were studied in the Crimea during 1919 and 1920. *Ricinus communis* [castor-oil plant] bears well and is very little attacked, but *Atropa belladonna* is severely injured, particularly by the flea-beetles, *Epitrix atropae*, Foudr., and *E. pubescens*, Koch, which riddle the leaves. These beetles oviposit during the summer in the ground, the eggs being laid singly. The larvae hatch in from seven to eight days and remain in the soil, where they pupate, adults emerging after six or seven days. *Psylliodes hyoscyami*, L., is occasionally found on belladonna, but more frequently on *Hyoscyamus niger*, L. The leaves and flowers of belladonna are also attacked by the caterpillars of *Barathra* (*Mamestra*) *brassicae*, L., and of *Heliothis peltigera*, Schiff. *Papaver somniferum* (poppy) is attacked by the Curculionid, *Ceuthorrhynchus macula-alba*, Hbst., the adults of which puncture the young fruits, the larvae living within the capsules. *Podagrica malvae*, Illig., occurs abundantly on *Althaea officinalis* and *A. rosea* (marshmallows), eating holes in the leaves and flowers ; the latter species is also attacked by the weevils, *Baris nitens*, F., *Apion longirostre*, Ol., and *A. validum*, Germ. The adults of *Apion* spp. appear in the middle of September. *Oxythyrea funesta*, Poda, devours the reproductive organs of *Althaea officinalis*. The flowers of *Foeniculum officinale* (fennel) are attacked by various Hymenoptera, Diptera and Coleoptera. The bug, *Graphosoma lineatum*, L., sucks the juices of fennel fruits.

Melissa officinalis (common balm) is cultivated in the Crimea both for its medicinal properties and also for use in apiculture, when it is used as a bait to attract swarms. Chrysomelid beetles, including *Cassida viridis*, L., and *Cryptocephalus ocellatus*, Drap., perforate the leaves. Wild medicinal plants also suffer from insect attacks, the belladonna found in the forests being attacked by *Epitrix* spp., and the flowers of *Adonis vernalis*, which is widespread in the Crimea, by *Amphicoma vulpes*, F.

Fisher (H. C.). **Report of the Health Department of the Panama Canal for the Calendar Year 1919.**—*Mount Hope, C.Z.*, 1920, 134 pp., 20 plates. [Received 21st April 1921.]

The most important *Citrus* pest in the Panama Canal zone is *Aleurocanthus woglumi*, Ashby (citrus whitefly), and it is gradually

spreading into the surrounding country. The most effective spray against it is paraffin oil and fish oil soap; but good results have also been obtained with linseed oil and fish oil soap, Panama Canal larvicide (crude phenol and rosin soap), and kerosene emulsion. The Coccinellids *Pentilia castanea*, Muls., and *Scymnus horni*, Gorh., as well as an undetermined lacewing, *Chrysopa* sp., sometimes greatly reduce the numbers of this pest. A larvicide spray followed in a day or two by clean water under pressure will clean the tree from this pest, and also from sooty mould.

Other insects recorded are *Coccus viridis*, Green (soft green scale), on coffee; *Trigona ruficrus corvina* (red-eyed grasshopper); *Solenopsis geminata*, F., causing severe damage by girdling the trees; *Lepidosaphes beckii*, Newm. (mussel scale); *Selenaspidus articulatus* (West Indian red scale) attacking a variety of plants, including *Citrus*; *Chionaspis citri*, Comst. (snow scale); *Chrysomphalus aonidum*, L. (red-spotted scale), on *Citrus* and roses; *Philaphedra broadwayi* (*theobromae*), on mango and cacao; *Vinsonia stellifera* and *Coccus mangiferae* on mango; a new species of *Heilipus*, *Ischnaspis longirostris*, *Pulvinaria pyriformis*, *Targionia biformis*, *Saissetia hemisphaerica* and *Ceroplastes* sp. on avocado; *Toxotrypana curvicauda*, Gerst., and *Aulacaspis* (*Diaspis*) *pentagona*, on papaya; *Metamasius sericeus* (West Indian sugar-cane borer) in banana stumps; *Brassolis isthmia*, Bates, on leaves of banana plants; *Pinnaspis buxi*, *Aspidiotus palmae*, *Diaspis boisduvali*, *Inglisia vitrea*, *Chrysomphalus dictyospermi*, *C. aonidum*, *Vinsonia stellifera*, and *Ischnaspis longirostris*, on coconut palms.

The pests of field, forage, vegetable and truck crops are *Laphygma frugiperda*, S. & A. (fall army-worm), cutworms, *Blissus leucopterus*, flea-beetles, termites, and *Aspidiotus* (*Targionia*) *hartii*, Ckll. The latter scale was abundant on yams.

Ornamental plants are attacked by *Hemichionaspis minor*, *C. aonidum*, especially severe on roses, *Selenaspidus articulatus*, *Saissetia nigra*, *S. hemisphaerica*, *S. oleae*, *Howardia biclavis*, *Orthezia praelonga*, *Icerya montserratensis*, R. & H., an ant, *Atta sexdens*, L., and the Noctuid moth, *Xanthopastis timais* f. *molinoi*, Dyar, the larvae of which were very destructive to lilies.

Nasutotermes cornigera, Hag., causes serious damage to woodwork. *Monomorium pharaonis*, L., is especially troublesome as infesting provisions.

The pests of stored products are *Tribolium castaneum* (*ferrugineum*), *Tenebrio* sp., *Silvanus surinamensis*, *Lepisma* sp., an Anobiid, *Calandra oryzae*, and the cadelle beetle [*Tenebroides mauritanicus*] in oats; and *Catorama herbarium*, Gorh., causing damage to corn brooms.

Xyleborus grenadensis, Hopk., was abundant in sawed Sanday wood logs.

Kalmbach (E. R.) & Gabrielson (I. N.). **Economic Value of the Starling in the United States.**—*U.S. Dept. Agric., Washington, D.C.*, Bull. 868, 10th January 1921, 67 pp., 3 figs., 4 plates. [Received 16th April 1921.]

The starling, *Sturnus vulgaris*, has few equals among the bird population of the north-eastern United States as an effective destroyer of terrestrial insects, which compose 41·55 per cent. of its food, the monthly percentages varying from 23·81 in February to 57·8 in

October. These figures result from the examination of a very large series of stomachs and extensive field observations in those parts of the United States where this bird is most abundant.

Nearly half of its insect food consists of Coleoptera, of which weevils, Carabids and Lamellicorns are the most important in the order named. The weevils furnish 8·5 per cent. of the starling's food. Nearly half (1,125) of the 2,301 adult birds examined had eaten clover-leaf weevils, *Hypera punctata*, and 12 had taken the larvae. In every month of the year the starling is searching the grasslands and weed patches for *H. punctata*, and the high percentages revealed in January and February would seem to indicate that this pest hibernates in far greater numbers than has been commonly believed. Another weevil eaten in considerable numbers is the lesser clover-leaf weevil, *Hypera* (*Phytonomus*) *nigrirostris*. The clover-root weevil, *Sitones hispidulus*, is also a favourite article of diet; while the closely-related *S. flavescens* is preyed upon to a less extent. Other species found were *Otiorrhynchus ovatus, O. sulcatus, Barypeithes pellucidus, Sphenophorus* spp.—a group of which *S. parvulus* (blue-grass billbug) was the most frequently taken—and *Phyxelis rigidus*. It is evident that the starling is a very effective enemy of weevil pests of grass or forage crops, and it may be said to be the most effective bird enemy of *Hypera punctata* in the United States.

Carabids constitute 5·71 per cent. of the starling's food. By far the greater part of the members of this family eaten by the starling are more or less vegetarian in their habits, notably species of the genera *Harpalus* and *Anisodactylus*. While it must be admitted that some useful species of Carabids are consumed, only a small number are decidedly beneficial ones.

The Lamellicorns follow the weevils and Carabids in the quantity of food furnished, 2·24 per cent. coming from this source. The bulk of this figure is represented by 11 species of *Lachnosterna* (*Phyllophaga*), the May beetle adults of the notorious white grubs. Both adults and larvae are eaten, the former more frequently. The starling also feeds on the recently imported Japanese beetle, *Popillia japonica*. Staphylinids, Chrysomelids, Elaterids, Tenebrionids, and other beetles were taken in varying numbers. Some species of economic importance include *Drasterius elegans, Agriotes mancus, Colaspis brunnea*, and *Leptinotarsa decemlineata*. The starling's destruction of Coleoptera is overwhelmingly in its favour.

Orthoptera constitute 12·41 per cent. of the annual food, and during October and November the starling secures practically all its insect food from members of this order, Tettigoniids and Gryllids predominating. Among the grasshoppers eaten were *Melanoplus femur-rubrum* (red-legged locust) and *Chortophaga viridifasciata* (green-striped locust).

Lepidoptera, mainly caterpillars, are chiefly attractive to nestlings, forming 38·21 per cent. of the food of young starlings and occurring in 274 of the 325 stomachs examined. Most of the caterpillars are cutworms. In the stomachs of adults, Lepidoptera constituted 6·04 per cent. of the yearly food. May and June are the months of greatest consumption, when such food represents 13·97 and 20·56 per cent. of the total. The army-worm (*Cirphis unipuncta*), the cabbage butterfly (*Pieris rapae*), and the American tent caterpillar (*Malacosoma americana*) are among the other Lepidoptera taken.

Of the other orders of insects, the Hymenoptera are best represented. Rhynchota form only an unimportant part (less than 1 per cent.) of the food.

No other bird equals the starling in the destruction of millipedes. It has recently been shown that millipedes are injurious, and damage to beans, strawberries, melons, potatoes, etc., has been attributed to *Julus caeruleocinctus,* which is a favourite food of the starling.

The most serious economic objection to the starling is its destruction of cherries. It only secures an extremely small portion of its sustenance from either sweet or field maize. The adult bird is primarily a feeder on insects and wild fruit—less than 6 per cent. of its yearly food being secured from cultivated crops. The damage it does is mainly due to its habit of concentrating in flocks.

The protection of this bird by law, except when it is actually doing or threatening harm, is considered advisable.

Doolittle (S. P.). **The Mosaic Disease of Cucurbits.**—*U.S. Dept. Agric., Washington, D.C.,* Bull. 879, 15th November 1920, 69 pp., 10 plates. [Received 27th April 1921.]

A large part of the dissemination of mosaic disease is often due to insects, including *Aphis gossypii,* Glov. (melon aphis), *Diabrotica vittata,* F. (striped cucumber beetle) and *D. duodecimpunctata,* Oliv. (twelve-spotted cucumber beetle). Transmission experiments were made with positive results and are tabulated.

The high percentage of infection obtained from inoculation by means of Aphids from diseased plants is probably due to the fact that Aphids, being sucking insects, introduce the virus into those tissues that will distribute it most rapidly throughout the plant. But though *A. gossypii* may be responsible for severe epidemics, *D. vittata* is probably the most important insect carrier, as it is common in most cucumber-growing districts and is usually abundant throughout the season. Experiments indicate that it can transmit the disease for only a short time after feeding on infected plants. *D. duodecimpunctata* is so similar to *D. vittata* that the above probably applies equally well to it.

While other cucumber pests may also transmit the disease, they are probably of less importance. *Lygus pratensis* (tarnished plant bug) probably carries it, but the few tests made with it proved negative. *Thrips tabaci,* Lind., *Tetranychus telarius,* L., and *Asterochiton* (*Aleurodes*) *vaporariorum,* Westw., have shown no indications of being carriers. As regards bees, the evidence thus far secured indicates that little, if any, infection is carried by them.

Dietz (H. F.) & Zetek (J.). **The Black Fly of Citrus and other subtropical Plants.**—*U.S. Dept. Agric., Washington, D.C.,* Bull. 885, 11th December 1920, 55 pp., 7 figs., 11 plates. [Received 20th April 1921.]

This report is based on an intensive study of the black fly, *Aleurocanthus woglumi,* Ashby, made in the Panama Canal Zone from June 1918 to August 1919. It includes information, some of which has not previously been published, from other sources, to which full reference is made.

A. woglumi was introduced into Jamaica from India on infested plants within the last 10–15 years and has now spread to Cuba, New Providence, the Canal Zone, the Republic of Panama and Costa Rica. Nursery stock or infested individual food-plants, including cuttings

for propagation, are responsible for the introduction and spread of this pest. Within a given region this method of spread is supplemented by the natural flight of the adults and their carriage on vehicles and clothing.

The more important food-plants of *A. woglumi* in the Canal Zone are *Ardisia revoluta*, *Citrus* spp., *Coffea arabica*, *Elaeis melanococca*, *Eugenia jambos*, *E. malaccensis*, *Lucuma mammosa*, *L. nervosa*, *Melicocca bijuga* and *Mangifera indica*. Under certain conditions plants are seriously injured, but none have been found to be killed by it in the Canal Zone and Republic of Panama.

The six stages in the life-history of *A. woglumi*, namely, the egg, three larval instars, the pupa and the adult, are described. There is a decided overlapping of stages. The duration of the various stages was as follows: egg, 11–20 days; three larval instars, 7–16, 5–30 and 6–20; pupa, 16–80; adult, probably 6–12. There is a great mortality in the various stages, only 22·5 per cent. of the individuals of 790 eggs reaching maturity.

In the Canal Zone drought in the dry season and the heavy rains during the wet are factors that tend to check the pest.

Natural enemies include the Coccinellids, *Hyperaspis calderana*, Gorh., *H. albicollis*, Gorh., *Scymnus thoracicus*, For., *S. horni*, Gorh., *S. coloratus*, Gorh., *S. adspersulus*, Gorh., and *Cryptognatha flaviceps*, Crotch. The larvae of a lacewing fly, *Chrysopa* sp., have occasionally been taken feeding on all stages of *A. woglumi*. The fungi, *Aschersonia* spp. and *Aegerita webberi*, attack the larvae and pupae. No internal parasites have been found.

Artificial control is necessary. The logical time for spraying in this region is in the dry season, but no data on sprays at this time have been obtained. Preliminary work during the rainy season has shown that such contact insecticides as 5 and 10 per cent. kerosene emulsions, fish-oil soap at the rate of 1 lb. to 2–4 U.S. gals. water, and nicotine oleate prepared according to Moore's formula [*R.A.E.*, A, vi, 422] give good results.

There is a possibility that *A. woglumi* may gain entrance into and become established in the United States, particularly Florida.

Collins (C. W.) & Hood (C. E.). **Gipsy Moth Tree-banding Material: How to make, use, and apply it.**—*U.S. Dept. Agric., Washington, D.C.*, Bull. 899, 14th December 1920, 18 pp., 4 figs., 7 plates. [Received 20th April 1921.]

As a result of practical experience the formula for a banding adhesive published by Burgess and Griffin [*R.A.E.*, A, v, 212] has been modified and changes in the method of mixing have been introduced.

The materials used are neutral coal-tar oil having a density of 1·12–1·15 at 20° C. (68° F.); hard coal-tar pitch, melting at about 49° C. (120° F.); resin oil, known as first-run "kidney," having a viscosity of 52 at 100° C. (212° F.), tested with a Saybolt universal viscosimeter; and ordinary commercial hydrated lime.

Coal-tar acids sometimes injure trees, hence the necessity for a neutral or nearly neutral oil. Resin oils vary in colour, viscosity, and acidity. The resin oil specified is of a medium to dark brown colour and contains 26 per cent. free acid. If the acid content is too low, the finished product will be too soft and will not stand up on the trees, even at moderate temperatures, and it becomes necessary to add more resin oil, which results in a tougher product that films

over quickly when on the trees. The resin oil specified saponifies in 4–10 minutes; oils that saponify more rapidly are not so satisfactory in use. If the commercial hydrated lime cannot be obtained, ordinary rock or quicklime can be used; it must be slaked with just enough water to make the resultant product a dry powder or hydrated lime. This should be passed through a sieve having 14 meshes to an inch; a coarser mesh should not be used.

The material was mixed in a 25-gallon soap kettle with an arrangement of stirring paddles; the kettle was provided with a steam-jacket, but usually no heat was required. As a rule, mixing should be done at 60–75° F. The construction of this plant is fully shown in a sectional figure.

The banding material was made in large quantities as follows: one part by weight of hard coal-tar pitch was placed in the kettle; one part by weight of coal-tar neutral oil was added; heat was then applied until the pitch had melted and thoroughly mixed with the oil; the kettle was then removed and two more parts by weight of coal-tar neutral oil were added and everything was thoroughly mixed. This product, known as "pitch neutral oil mixture," could be poured and worked after cooling, and formed a stock mixture.

To prepare the banding material, 18 lb. of the stock mixture and 70 lb. of the coal-tar neutral oil were placed in the kettle and stirred. In a few moments 12 lb. of hydrated lime was added slowly. When the contents had become of a uniform consistency 50 lb. of resin oil was added and mixed for a few minutes, or until the contents began to thicken. Then 20 lb. of coal-tar neutral oil was added, and the contents were thoroughly mixed. The stirring was then stopped, and the material poured into containers. In 2–3 days it had set to a semi-solid state. In cold weather it is slightly stiff, but it can be applied easily at 35° F. At higher temperatures it works very easily.

The above product is suited to New England or a similar climate. For a warmer climate it may, if required, be made harder by slightly increasing the amount of resin oil and lime. In a much colder climate it may be made softer by the addition of a little more coal-tar neutral oil.

If an excess of lime is added to bring the material up to the desired consistency, the product will have a more or less granular appearance and will soon become devoid of the most desirable oily surface when on the trees.

If the viscosity of the resin varies, the amount used must be altered. A reduction of 4 lb. resin oil should be made to every 15 points increase in viscosity. Each 4 lb. reduction of resin oil entails a 4 lb. addition of coal-tar neutral oil. Half this addition is made to the amount first added (70 lb. in the formula), and half to the amount last added (20 lb.) to the mixer.

The material is most conveniently applied by a special "gun," a full description of which is given. It consists of a tin cylinder with a plunger and flat nozzle, delivering a band $\frac{26}{32}$ by $\frac{7}{32}$ inch, which is suitable where the infestation is not too severe and is the most satisfactory under average conditions.

The bands may be placed low down or 5–8 feet high. In the first case small caterpillars will not be able to climb up into a position from which they may be dislodged and dispersed by the wind. In the second case cattle and other animals are unable to rub against them. If regular or frequent care cannot be given to the bands, it

may be advisable to use broader ones of $1\frac{1}{4}$ or more inches width. Double bands are also very effective where the infestation is very heavy.

Banding was found to be effective against *Porthetria dispar*, L. (gipsy moth), *Nygmia phaeorrhoea*, Don. (*Euproctis chrysorrhoea*) (brown-tail moth), *Hemerocampa leucostigma*, S. & A. (white-marked tussock moth), *Notolophus antiqua*, L. (rusty tussock moth), *Malacosoma disstria*, Hb. (forest tent caterpillar), *Halisidota tessellaris*, S. & A. (checked tussock), *Hyphantria cunea*, Dru. (fall webworm), *Telea polyphemus*, Cram. (American silkworm), *Alsophila pometaria*, Harr. (fall canker-worm), *Palaeacrita vernata*, Peck. (spring canker-worm), *Ennomos subsignarius*, Hb. (snow-white linden moth), and *Xylina antennata*, Wlk. (ashen pinion).

In the laboratory the following species were found to be unable to free themselves from the adhesive : *Estigmene acraea*, Dru. (salt-marsh caterpillar), *Plathypena scabra*, F. (green clover worm), *Schizura concinna*, S. & A. (red-humped apple caterpillar), *Heterocampa guttivitta*, Wlk. (saddled prominent), and *Malacosoma americana*, F. (tent caterpillar).

Isely (D.). **Grapevine Looper.**—*U.S. Dept. Agric., Washington, D.C.*, Bull. 900, 11th December 1920, 15 pp., 4 plates. [Received 20th April 1921.]

The Geometrid moth, *Lygris diversilineata*, Hb., defoliates grapevines and the Virginia creeper. This paper deals with its biology and control in the Erie-Chautauqua grape belt of Pennsylvania.

The winter is passed in the egg stage, and most of the eggs hatch during the first two weeks of June. The larval feeding period averages about 46 days. Two days are spent as a prepupa and ten as a pupa in a loose web spun on a fold of a leaf or grape cluster. The moth emerges in mid-summer and deposits eggs that hatch in the following year. The newly-hatched caterpillars are strictly solitary and scatter over the vine. More than two or three are seldom found on a leaf. Their attack is characterised by a series of whitish patches on the upper surface of the leaf extending around the edge.

Lead arsenate, $1\frac{1}{2}$ lb. of powder or 3 lb. paste to 50 U.S. gals. liquid (water or Bordeaux mixture), is the minimum strength that will kill all stages of this pest. It should be remembered that a spray directed primarily against the grapevine rootworm (*Fidia viticida*) and the grape-berry moth (*Polychrosis viteana*) immediately after the blossoms have fallen incidentally controls *L. diversilineata* also.

Isely (D.). **Grapevine Flea-beetles.**—*U.S. Dept. Agric., Washington, D.C.*, Bull. 901, 13th December 1920, 27 pp., 4 plates. [Received 20th April 1921.]

The grapevine flea-beetle, *Haltica* (*Altica*) *chalybea*, Ill., eats out the swelling buds in early spring in Pennsylvania, thus destroying the embryonic shoots and fruit-clusters. Later both adults and larvae feed upon the leaves. It is single-brooded, and winter is passed in the adult stage. The eggs are deposited in batches under bud-scales or strips of bark. The larvae migrate to the leaves to feed and enter the soil to pupate. The adults emerge in early summer.

Statements that the eggs are laid on leaves, that the insect is two-brooded, and that it prefers thin-leaved types of grapes as hosts

rather than the Concord variety, are due to a confusion with a closely-allied species, the lesser grapevine flea-beetle, *H.* (*A.*) *woodsi*, sp. n., hitherto usually determined as a small form of *H. chalybea*. The various stages of both species are described. *H. woodsi* is also single-brooded, but emerges late enough in the season to have the appearance of a second brood of *H. chalybea*. Its eggs are deposited singly, or sometimes as a cluster of two or three on the underside of the leaf.

There is hardly any other insect that can cause such severe injury to the grape crop as that of which *H. chalybea* is capable when the buds are swelling. *H. woodsi*, which emerges later, is less destructive. Both species are sporadic in their occurrence from season to season.

A number of predatory enemies contribute to their natural control. Of these, the Carabid, *Lebia viridis*, Say, is the most important. *L. ornata*, Lec., and *Harpalus erythropus*, Dej., were found in very small numbers in leaf mould under wild grape-vines, and fed upon pupae and prepupae in confinement. A brown ant, *Myrmica scabrinodis*, Nyl., sub-sp. *schenchi*, Emery, var. *emeryana*, Forel, destroyed a large amount of larval and pupal material intended for rearing work. A number of birds also eat grape-vine flea-beetles.

Where vineyards are liable to injury, vigilance in early spring is essential, as the voracity of the beetles makes prompt action necessary. A spray application of lead arsenate, 1½ lb. powder or 3 lb. paste to 50 U.S. gals. water, is ordinarily recommended for large areas, but if the infestation is severe and rains can be avoided, double the strength may be used. In small areas the most effective and cheapest measure is handpicking. The larvae of *H. woodsi*, and most of those of *H. chalybea*, may be readily destroyed by the usual sprays applied against the grape-berry moth (*Polychrosis viteana*) and the grape-vine rootworm (*Fidia viticida*). Very rarely a spray application before the grapes bloom will be advisable to destroy the earliest larvae of *H. chalybea*. These measures have probably caused the grape-vine flea-beetle to change its status from that of a first-class pest twenty years ago to one of second-rate importance.

WOGLUM (R. S.). **Fumigation of Citrus Plants with Hydrocyanic Acid: Conditions influencing Injury.**—*U.S. Dept. Agric., Washington, D.C.*, Bull. 907, 20th October 1920, 43 pp., 1 fig., 4 plates. [Received 27th April 1921.]

In dealing with injury due to fumigation with hydrocyanic acid gas, scant attention has hitherto been given to the pre-fumigation and post-fumigation environments, and the results of a study of the influence of heat and light under these conditions are here recorded.

Sunshine is the chief pre-fumigation factor that increases injury; it is more active at high temperatures. In darkness or diffused light, temperatures up to 100° F. do not appear to increase injury unless the fumigation or post-fumigation temperatures exceed 80° F.

The environment after fumigation is almost as important as that during the actual treatment. Sunshine is most destructive to plants exposed immediately after treatment, and affects them deleteriously at least two hours afterwards. Temperatures of 80° F. or above injure plants more than lower temperatures. The fumigation of citrus plants is best done below 80° F.

Diffused light before, during, or after fumigation exerts no more deleterious effect than darkness. Moisture on citrus plants does not

increase the degree of injury. Sudden changes of temperature over a wide range during exposure to the gas tend to increase plant injury considerably. The optimum environment for safety to plants is diffused light or darkness at uniform temperatures below 80° F. before, during, and after fumigation; the lowest temperature tried, 55° F., was within the optimum range. Fumigation at temperatures upward of 80° F. is safest under cool pre- and post-fumigation environments. The maximum of injury follows high temperatures for all three environments.

The physical and chemical conditions of the soil influence injury from fumigation. Trees in a wet soil tend to suffer more than healthy trees in a dry soil. Trees weakened by drought are, however, more susceptible to injury than if grown under optimum moisture conditions. Irrigation should follow fumigation, not precede it.

The physiological condition of the plants is a most important factor, and a condition of hardiness is the optimum for gas resistance; it is brought about by dryness of soil, cold weather, and possibly by continued very hot dry weather.

INGERSON (H. G.). **Life-history of the Grape-berry Moth in Northern Ohio.**—*U.S. Dept. Agric., Washington, D.C.*, Bull. 911, 13th December 1920, 38 pp., 5 figs. [Received 20th April 1921.]

In northern Ohio there is one full brood of *Polychrosis viteana*, Clem., and a partial second in the year, the second brood of caterpillars being much larger and more destructive. *P. viteana* hibernates in the pupal stage in cocoons in old grape leaves under the grape trellis. The mortality of such pupae was from 76 to 80 per cent. The first moths emerge in spring about 10 days before the grapes begin to bloom, but the greatest emergence was during and immediately after the bloom. Oviposition begins about four days after emergence; incubation takes 3–10 days, with an average of 5 days.

The first brood larvae feed in the young grapes for 14–37 days —with an average of 20·6 days in 1917. They then spin their cocoons on the tender leaves. The prepupal stage lasted 1–3 days in 1917, and the pupal 11–16. The life-cycle of the first generation, taken as a total of the separate stages, was 39·79 days, with a maximum total of 76 and a minimum of 23.

The second brood egg-stage varied from 4 to 10 days. The feeding period was from 16 to 36 days in 1916, with an average of 24·18, but all other records have given 40 days, which is probably more accurate. Second-brood caterpillars begin to leave the fruit early in the autumn. In each brood the females predominate, there being three or more females to one male. A small part of the first brood caterpillars hibernate and yield moths in the following spring. Notes are given on mating and oviposition. The habit of the caterpillars of feeding on the leaf-galls of the grape-vine *Phylloxera* was observed. The caterpillars can resist extremely low temperatures, such as 17° F.

Parasitism was very low and of no value as a check. The measures advised are cultural methods that will expose the hibernating pupae to the elements. Satisfactory results were obtained by two applications of spray by the "trailer" or hand method of spraying. The first application should be made 3-5 days after the young grapes set, and the second when the grapes first touch in clusters.

CHITTENDEN (F. H.). **The Red-banded Leaf-roller.**—*U.S. Dept. Agric., Washington, D.C.*, Bull. 914, 9th December 1920, 14 pp., 5 figs. [Received 20th April 1921.]

The Tortricid moth, *Eulia velutina*, Wlk. (red-banded leaf-roller), is a pest of beans, sweet potato, asparagus, strawberry, raspberry, etc., that at times attracts considerable attention. It is a native of the United States, where it enjoys a wide distribution from Maine to Texas, and it has also been found in California. It breeds continuously throughout the growing season, from April to November.

In the District of Columbia hibernation takes place exclusively in the pupal stage, which lasts five months. In June and July the egg-stage lasted 11 days, the larval stage 22 days, and the pupal a minimum of six days. There are at least two generations annually and probably three where the climate is favourable. The various stages are briefly described.

Several natural enemies, mostly parasites, attack *E. velutina*. They include the Hymenoptera, *Exochus curvator*, F., *Epiurus indagator*, Wlsh., *Lampronota pluralis*, Cress., *Limnerium* sp., *Opius foersteri*, Gah., *Epirhyssalus atriceps*, Ashm., *Smicra delira*, Cress., *S. torvina*, Cress., *Apanteles canarsia*, Ashm., and a Tachinid fly, *Phorocera parva*, Big.

Artificial measures are seldom warranted, but a spray, containing 2–3 lb. of lead arsenate to 50 U.S. gals. water, may be applied when the caterpillars are feeding. The best time is soon after oviposition. In cases of slight infestation the webbed leaves may be crushed by hand, or they may be clipped and burned. Early autumn ploughing and burning over the garden after the crop is off, either in autumn or early spring, will greatly help to keep this pest in check.

TOWER (D. G.) & FENTON (F. A.). **Clover-leaf Weevil.**—*U.S. Dept. Agric., Washington, D.C.*, Bull. 922, 21st December 1920, 18 pp., 8 figs. [Received 20th April 1921.]

All stages of *Hypera punctata* (clover-leaf weevil) are described. This weevil oviposits in or on clover or lucerne. The eggs laid previous to 25th October hatch the same autumn, and the larvae hibernate; those laid later hibernate as eggs and usually hatch in March. After feeding on the foliage the larvae spin cocoons at or just below the surface of the ground, pupate, and give rise to the adults in June or July. The beetles feed on the foliage of clover intermittently until September, when they mate, and soon afterwards oviposition begins. Since the period of oviposition extends over a number of weeks, and, furthermore, eggs laid late in the season do not hatch until spring, the various stages greatly overlap.

Details are given as to oviposition, the habits of the larvae, and the feeding experiments made to ascertain the amounts of clover foliage eaten by *H. punctata* at different seasons and during the larval and adult stages. The amount eaten by individual larvae averages 3·09 square inches of red clover foliage, and of this amount approximately 80 per cent. is consumed during the last instar.

The life of the adult is divided into two distinct feeding periods, separated by one of inactivity during July and August. Beetles deprived of foliage immediately after emergence die within a few days. Adults emerging late in May become dormant late in June, while

those emerging from the middle to the end of June do not stop feeding until early in July. During the post-dormant stage the food consumed daily is not one-tenth as much as is eaten during the pre-dormant stage.

H. punctata is an important pest of clover, though its annual toll usually passes unnoticed. It seldom devastates entire fields, however, because the larvae are checked by a fungus, *Empusa sphaerosperma*, which kills them in April and May and again in October and November. A small beetle, *Collops quadrimaculatus*, F., feeds on the eggs, and one of the tiger beetles, *Cicindela repanda*, Dej., probably preys on the larvae. Poultry and birds, of which a list is given, feed on *H. punctata*, which also forms the food of toads and frogs.

Usually the need for remedial measures becomes apparent too late. It is a good practice to pasture lightly all first-year clover in the autumn or to clip it back in spring, and further to hinder the increase of this insect in the locality by thoroughly ploughing under the second-year crop in the autumn. These measures seem all that is ordinarily necessary to prevent injury.

HAYWOOD (J. K.). **Report of the Insecticide and Fungicide Board [1919–20].**—*U.S. Dept. Agric., Washington, D.C.*, 1920, 6 pp. [Received 27th April 1921.]

The work of the insecticide and fungicide board for the year ended 30th June 1920 is reviewed, and the various campaigns carried out for the protection of insecticides and fungicides from adulteration are described.

MARLATT (C. L.). **Report of the Federal Horticultural Board [1919–20].**—*U.S. Dept. Agric., Washington, D.C.*, 1920, 29 pp. [Received 27th April 1921.]

The work for the year ended 30th June 1920 is reviewed, and a list of current quarantine and other restrictive orders is appended. Numerous reinfestations by the pink bollworm (*Platyedra gossypiella*) have been found in Texas. The entire areas involved were immediately subjected to intensive cleaning operations. The Pink Bollworm Act of 1920 provides for the prompt destruction of the cotton in infested fields. In spite of the compensation to planters for crops destroyed, their opposition put a serious check on the State and Federal control work. It may become necessary to consider the extension of the existing Federal quarantine to cover the entire State as the only means of protecting surrounding States from the movement of materials from Texas capable of carrying the pest. Under existing conditions in Texas there seems little likelihood that non-cotton zones can be adequately enforced in the future, but eradication may still be possible with adequate State legislation and thorough work in connection with still existing non-cotton zones. The bulk of the information given with reference to the existing conditions in Louisiana and quarantine regulations have been noticed elsewhere [*R.A.E.*, A, viii, **511**], as has also the information concerning the European corn borer (*Pyrausta nubilalis*, Hb.) [*loc. cit.* and ix, **14**, **159**].

In view of the existence of *Eriophyes gossypii*, Banks (cotton blister mite) and a cotton boll disease in Porto Rico, a quarantine has been issued against Porto Rican cotton, cotton seed and cotton seed products.

The Japanese beetle [*Popillia japonica*] quarantine has been extended since 1st October 1920 to include the extension of the pest in New Jersey and its spread into Pennsylvania. This quarantine provides for the movement under inspection and certification of all the articles brought under restriction.

Coad (B. R.) & Cassidy (T. P.). **Some Rules for Poisoning the Cotton Boll Weevil.**—*U.S. Dept. Agric., Washington, D.C.,* Dept. Circ. 162, January 1921, 4 pp. [Received 16th April 1921.]

This paper briefly states the information required by farmers when considering the advisability of poisoning the cotton boll weevil (*Anthonomus grandis*) and the best means of carrying out the work.

Coad (B. R.) & Moreland (R. W.). **Dispersion of the Boll Weevil in 1920.**—*U.S. Dept. Agric., Washington, D.C.,* Dept. Circ. 163, 2nd January 1921, 2 pp. [Received 16th April 1921.]

During 1920 the movement of the boll weevil [*Anthonomus grandis*] has been retarded in the eastern portion of the cotton belt, but a large portion of territory has been reinfested in Oklahoma and Texas. Altogether 42,621 square miles of new territory have been invaded in 1920, and only 752 square miles were freed, this occurring in Tennessee. Only about 73,000 square miles of cotton-producing territory remain uninfested. The extent of infestation in each State is briefly dealt with. Considering the cotton-producing States as a whole, an average of only 16·2 per cent. of the total cotton crop is produced on uninfested territory.

Urbahns (T. D.). **Grasshopper Control in the Pacific States.**—*U.S. Dept. Agric., Washington, D.C.,* Farmers' Bull. 1140, October 1920, 16 pp., 11 figs. [Received 27th April 1921.]

The most common species of grasshoppers are described and remedial measures are discussed, of which poisoned bran mash has proved the most successful [*cf. R.A.E.,* A, viii, 47]. A programme for organised community action is outlined.

Hofer (G.). **The Aspen Borer and how to control it.**—*U.S. Dept. Agric., Washington, D.C.,* Farmers' Bull. 1154, October 1920, 11 pp., 9 figs. [Received 27th April 1921.]

The most widely distributed insect causing injury to aspen trees is *Saperda calcarata,* Say, of the life-history of which a brief description is given [*cf. R.A.E.,* A, vii, 300]. The natural enemies include a Hymenopterous egg-parasite, a fly parasitic on the larvae, and a fungous disease responsible for the destruction of about 2 per cent. of the mature larvae. Insects associated with the injury by *S. calcarata* are *Agrilus anxius,* Gory, *Poecilonota cyanipes,* Say, *Dicerca prolongata,* Lec., *Cossus* sp., *Xyloterus* sp. and *X. obliteratus,* Lec.

Back (E. A.). **Angoumois Grain Moth.**—*U.S. Dept. Agric., Washington, D.C.,* Farmers' Bull. 1156, September 1920, 20 pp., 16 figs. [Received 27th April 1921.]

The economic importance of *Sitotroga cerealella,* Oliv. (Angoumois grain moth) is discussed, and remedial measures for it are advocated [*R.A.E.,* A, vi, 12, 202; vii, 543]. All insects may be destroyed by heating to a temperature of 120° F. without injuring the germinating power of the grain.

The parasite *Pteromalus gelechiae*, Webster, and the mite, *Pediculoides ventricosus*, Newp., kill a certain number of this moth, but cannot be depended on as a means of control either in the field or in storage.

Reeves (G. I.), Chamberlin (T. R.) & Pack (K. M.). **Spraying for the Alfalfa Weevil.**—*U.S. Dept. Agric., Washington, D.C.*, Farmers' Bull. 1185, December 1920, 20 pp., 9 figs. [Received 20th April 1921.]

The method of spraying lucerne with arsenicals against the alfalfa weevil (*Hypera variabilis*) here described is the result of seven years' study and experiment and one season of field trial, in the course of which over 4,000 acres were successfully treated. The feeding larvae are most numerous about one to two weeks before the first crop is ready for cutting, and this has proved the best moment for spraying, the date depending on weather conditions. The treatment described can be used for both large and small acreages in most of the territory of Utah, Idaho, Colorado and Wyoming.

Oshima (M.). **Philippine Termites collected by R. C. McGregor, with Descriptions of one new Genus and nine new Species.**—*Philippine Jl. Sci., Manila*, xvii, no. 5, November 1920, pp. 489–512, 4 plates. [Received 25th April 1921.]

Coptotermes formosanus is recorded for the first time from the Philippine Islands. The new species described include :—*Calotermes* (*Neotermes*) *lagunensis* in an old palm stub, and *Termitogetonella tibiaoensis*, gen. et sp.n., in a log.

C.C. **Le Ver du Coton aux Antilles Anglaises.**—*Agron. Coloniale, Paris*, vii, no. 39, March 1921, pp. 89–90.

In view of the establishment of *Platyedra* (*Gelechia*) *gossypiella* in Montserrat and St. Kitts [*R.A.E.*, A, ix, 99], the danger of its spread to Guadeloupe and Martinique is imminent, and the necessity for the application of vigorous preventive measures is emphasised.

Mertens (—). **Les Plantations de Caféiers de Lula (Stanleyville).**—*Bull. Agric. Congo Belge, Brussels*, xi, no. 3–4, September–December 1920, pp. 243–251, 6 figs. [Received 25th April 1921.]

The coffee pests recorded for 1919 are *Stephanoderes* sp., Coccids, Aphids and red ants. In May 1920 a serious attack of borers was noticed, the species involved being a Longicorn, *Tragocephala anselli*, and a Bostrychid, *Apate monacha*. These beetles may be destroyed by injecting a solution of carbon bisulphide into the galleries.

Muratet (H.). **The Lucerne Grub** (*Colaspidema atrum*) **injurious to Vegetable and Garden Plants in France.**—*C. R. Séances Acad. Agric. de France, Paris*, v, no. 38, 10th December 1919, pp. 970–972. (Abstract in *Mthly. Bull. Agric. Intell. & Pl. Dis., Rome*, xi, no. 2, February 1920, p. 275.) [Received 26th April 1921.]

Colaspidema atrum, while usually injurious in lucerne fields, occasionally does considerable damage in gardens and vegetable plots, showing a preference for the outer flowers of the marguerite, leaves of beans and parsley, potato leaves being less severely attacked. These infestations apparently only occur when there is a shortage of the normal food supply of the beetle.

Faes (H.). *Psyche graminella*, **a Macrolepidopteron occasionally injurious to Vines in Switzerland.**—*La Terre Vaudoise, Lausanne*, xi, no. 49, 6th December 1919, pp. 435–437. (Abstract in *Mthly. Bull. Agric. Intell. & Pl. Dis., Rome*, xi, no. 2, February 1920, p. 277.) [Received 26th April 1921.]

Psyche unicolor (*graminella*), which generally feeds on grass culms, occasionally attacks the young leaves of grape-vines in Switzerland when its normal food-plant fails. When this occurs, the cases containing the caterpillars should be collected, and 1 lb. of copper aceto-arsenite should be added to each 25 gals. of Bordeaux mixture used on the vines.

Entomologie.—*Bull. Soc. Nat. Acclimat. France, Paris*, lxviii, no. 4, April 1921, p. 56.

A Scolytid making numerous galleries in firs in the Seine-et-Oise region has been identified as *Polygraphus poligraphus*; this is the only Hylesine beetle that adapts itself to fir and also attacks pine, Norwegian pine, and even larch. Remedial measures are difficult; trap trees during the whole growing period are recommended, and all dead or decaying bark should be removed in the spring.

Storey (G.). **The Present Situation with regard to the Control of the Pink Boll Worm in Egypt.**—*Egypt: Minist. Agric., Tech. & Sci. Service, Cairo*, Bull. 16, 1921, 16 pp.

The results obtained in Egypt in the control of the pink bollworm, *Platyedra* (*Gelechia*) *gossypiella*, Saund., by following the recommendations of the entomologist entrusted with the work and the regulations of the Ministry of Agriculture, are discussed. The removal and burning of all green or dead bolls left on the plants after picking has never been given a fair trial, as much opposition has been raised against this practice, and there is a great tendency among natives to knock the dead bolls on to the ground instead of picking, which renders this method worse than useless. Earliness in ripening the crop and dealing with the old cotton plants after picking has long been recognised as of primary importance in bollworm control. Early ripening means a lighter attack at the time of picking, and early pulling up means a lighter attack in the following season. It is fairly certain that the short-cycle moths, if they can find no plants on which to oviposit, die without leaving any progeny. It is the long-cycle larvae, which hibernate through the winter and produce moths in the following cotton season, that carry on the infestation from one year to another. There is a gradual tendency, as the season progresses, to assume the long-cycle habit, and there is also a rapid increase in long-cycle individuals at the end of the season. Thus, the earlier the cotton sticks are pulled up the fewer hibernating bollworms will be left, and the difference of a few days appreciably reduces the numbers in the following year.

There has been a remarkable decrease in the severity of pink bollworm attack during the past few years. This is considered to be due in part to the bollworm campaigns, but also to other factors, such as parasites, weather and changes in agricultural practice. It has been shown that by reducing the watering after the middle of July, the bolls can be made to ripen very early. This practice also gives the parasites a longer period in which to attack the bollworms.

The chief parasite, *Pimpla roborator*, F., can only reach the larvae after the bolls have opened, and it ceases to breed in January. Pulling up the cotton sticks causes the green bolls on them to dry and open. It is suggested that the pulling up of all cotton sticks should be enforced at as early a date as possible consistent with the picking of the crop. The date should be fixed every year for each district. All old regulations regarding the treatment of seed should remain essentially unaltered, but should be strengthened in details. All cotton should be ginned before 1st May, whereas under the present law unginned cotton can be kept in licensed, moth-proof stores from 1st May to 1st August. Moreover, in most ginneries piles of low-grade cotton, refuse, sweepings, etc., are allowed to accumulate in the yards until the end of the season and are then sold for re-sifting. This material contains many larvae that escape treatment altogether. A law should be passed forbidding the sale of this untreated material, except, in special cases, to other ginners who have the necessary apparatus for treating the seed.

The importance of propaganda and research to discover and encourage the best methods of cultivation and of dealing with the pest is emphasised.

Hall (W. J.). **Report on a Preliminary Campaign against the** *Hibiscus* **Mealy Bug in the Cairo Nursery Gardens.**—*Agric. Jl. Egypt, Cairo,* x, 1920, pp. 1–6. [Received 26th April 1921.]

Owing to an outbreak in Cairo of a new mealy-bug, provisionally called the *Hibiscus* mealy-bug, a campaign was organised to combat the pest. The food-plants include *Hibiscus*, *Grevillea*, mulberry, *Erythrina*, *Zizyphus*, *Ceratonia*, *Acalypha*, *Acacia lebbek* and *Bauhinia*. *Citrus*, jasmin, quince, oleander, *Poinciana* and *Jacaranda* are also occasionally attacked, but the infestation is dependent on the proximity of *Hibiscus*, *Grevillea*, mulberry or other highly susceptible trees. Guavas may also be attacked. The insect is generally found at the end of the shoots, causing them to become gnarled and deformed.

The campaign lasted 32 days, and details of the work are given; infested portions were pruned off and then sprayed with paraffin emulsion. The stock solution consisted of 2 gals. paraffin, 1 gal. water and ½ lb. hard soap. For use this was diluted with five times its volume of water. All infested portions were burnt or at least passed through fire. Heavily infested *Hibiscus* plants were uprooted and burnt, and the same treatment was sometimes applied to *Acalypha* trees. By removing the centres of infection, it will be comparatively easy to suppress infestation in the future. Altogether 57 nurseries were treated, covering a total area of about 199 acres and necessitating the use of 606 gals. of paraffin. In future a similar campaign could be carried out for about one-third of the cost, but it should be started considerably earlier. The advisability of making frequent inspections and the organisation of systematic work throughout the winter is emphasised.

Adair (E. W.). **Note on Fruit Flies occurring in or which might be introduced into Egypt.**—*Agric. Jl. Egypt, Cairo,* x, 1920, pp. 18–20. [Received 26th April 1921.]

The only fruit-flies hitherto known in Egypt are *Ceratitis capitata*, Wied.; *Dacus longistylus*, Wied., in pods of the large milk weed,

Calotropis procera; and two unidentified Trypetids from fruits of *Zizyphus spina-christi* and the safflower (*Carthamus tinctorius*) respectively. Species recently imported into Egypt are:—*Dacus* (*Chaetodacus*) *zonatus*, Saund., in mango at Port Said; *D. oleae*, Meig., in olives from Cyprus; and *Myiopardalis* (*Carpomyia*) *pardalina*, Big., which infests cucurbits. The possible establishment of these flies should be prevented, and the introduction of others, such as *Dacus* (*Chaetodacus*) *ferrugineus*, F., and *D. cucurbitae*, Coq., should be guarded against.

Gibson (G. W.). **The Value of Lime, Salt, and Sulphur as a Winter Wash for Figs against the Cup Scale** (*Asterolecanium pustulans*).—*Agric. Jl. Egypt, Cairo,* x, 1920, pp. 41–47. [Received 26th April 1921.]

The larvae of *Asterolecanium pustulans*, Ckll., hatch in small numbers during June in the Faiyûm; infestation continues throughout July, and the larvae are very numerous in August and September; they have also been observed in October. This scale is only active during the larval stage. The food-plants include oleander, *Jacaranda, Cassia, Geranium,* etc.

In the case of the fig, the wood, leaf, stalk and even the fruit may be attacked. During 1917 and 1918 a solution of 25 to 40 lb. of quick lime, 20 lb. of sulphur, 15 lb. of salt, and 60 gals. of water was applied as a spray to the fig trees. It should be used while still warm. During 1917 the work was carried out in January, and in 1918 it was completed by 12th February. Earlier applications would probably be better, and would avoid the retarding effect the spray has on fruit trees when applied late in the season. Further experiments are desirable with reference to time of spraying, as a late crop is not desired. Spraying should not be done after the buds burst, or serious scorching may result. Dried leaves should be removed before spraying. Owing to a serious attack of *Rhizopus nigricans*, the yield of the 1918 crop was much smaller than that of 1917, but the general results indicate the benefit of spraying, particularly if applied in successive years if there is danger of reinfestation from adjacent plots.

Growers are advised to start with clean cuttings and to give careful attention to irrigation and heavy manuring to keep the trees as vigorous as is consistent with the production of fruit. The trees should not be surrounded by other plants susceptible to this scale, unless equally amenable to treatment. Spraying is not worth while until the second winter, unless there is an immediate source of infestation.

Report of Entomological Division on Plant Pests.—*Trop. Agric., Peradeniya,* lvi, no. 3, March 1921, pp. 147–150.

The work in connection with *Xyleborus fornicatus* (shot-hole borer of tea) has been continued. Experiments with castor-oil plants as trap trees are still in progress. *Homona coffearia* may be controlled by the application of lime and a good system of flight breaks throughout the estate. Leaf-eating caterpillars and tea mites have been responsible for a considerable amount of damage; the most important of these are *Natada nararia* (fringed nettle grub), *Heterusia cingala* (red slug), *Stauropus alternus* (lobster caterpillar), *Psyche vitrea, Clania variegata, Tetranychus bioculatus* (red spider), *Eriophyes*

(*Phytoptus*) *carinatus* (purple mite) and *Tarsonemus translucens* (yellow mite). Other pests of tea are *Saissetia hemisphaerica*, *Coccus viridis*, the grubs of the cockchafers, *Lepidiota pinguis* and *Anomala superflua*, the termite *Calotermes militaris*, *Oscinis theae*, *Helopeltis antonii*, *Toxoptera coffeae* (*Ceylonia theaecola*, Buckt.), *Zeuzera coffeae*, and *Gracilaria theivora*.

The pests of rubber are *Saissetia hemisphaerica* and *S. nigra*, which are generally checked by the fungus *Aschersonia* sp., and *Batocera rubus*.

Nephantis serinopa is recorded on coconuts.

GIBSON (A.). **The Value of Insectivorous Birds to Agriculture.**—*Agric. Gaz. Canada, Ottawa*, viii, no. 2, March–April 1921, pp. 126–127.

The value of birds as destroyers of noxious insects is discussed, and the observations of many authors on this subject are quoted.

SANDERS (G. E.). **Spraying versus Dusting.**—*Agric. Gaz. Canada, Ottawa*, viii, no. 2, March–April 1921, pp. 134–136.

The advantages and disadvantages of dusting are enumerated. Recent experiments show that dusting is cheaper and is just as efficient in the control of fungous diseases and biting insects as spraying, but the latter is superior in the control of sucking insects, such as *Psylla* sp. and green apple bug (*Lygus communis*).

PILLAI (N. K.). **Entomology.**—*Rept. Dept. Agric. & Fisheries, Travancore 1919–1920, Trivandrum*, 1921, p. 3. [Received 26th April 1921.]

Removal and destruction of affected plants has been shown to be a successful remedy against the moth borers, *Schoenobius incertellus* (*bipunctifer*) and *Chilo simplex* in rice. *Spodoptera mauritia* causes serious damage to punja rice, and may be destroyed by the application of lime and ashes in equal proportions, or Paris green and lime 1 : 80, especially when the larvae are very young. Bagging with hand nets is the only successful remedial measure against the rice bug (*Leptocorisa varicornis*).

Nephantis serinopa (coconut leaf-roller) was the most important pest of coconut palms dealt with during the year. The attacked leaves should be cut off and burnt. Regulations have now been passed for the eradication of this pest. Other miscellaneous pests recorded are the rhinoceros beetle (*Oryctes rhinoceros*), the rice Hispid and a mealy-bug (*Pseudococcus* sp.).

SMALL (W.). **Annual Report of the Acting Entomologist for 1919–20.**—*Uganda Dept. Agric., Ann. Rept., 1919–20, Entebbe*, 1921, p. 41. [Received 21st April 1921.]

The usual insect pests were dealt with during the year, but no special investigations were undertaken. The most important coffee pests were the berry borer [*Stephanoderes hampei*], variegated bug [*Antestia lineaticollis*], thrips, Aphids and root scale, *Pseudococcus citri*. No pests of cacao or Para rubber have been recorded during the last seven months, and only stainers [*Dysdercus*] are recorded on cotton. Enquiries have also been made with reference to termites and the banana borer [*Cosmopolites sordidus*].

Tattersfield (F.) & Roberts (A. W. R.). **The Influence of Chemical Constitution on the Toxicity of Organic Compounds to Wireworms.** —*Jl. Agric. Sci., Cambridge,* x, pt. 2, April 1920, pp. 199–232, 18 diagrams. [Received 27th April 1921.]

The object of the present investigations was to study the toxic values of a series of organic compounds with respect to wireworms, *Agriotes* spp., and to correlate as far as possible the toxic values with chemical constitution and physical properties. The observations of various authors are reviewed [*R.A.E.*, B, v, 131, 174; A, vi, 200, 397].

The technique employed in the present experiments is described. In all, more than 75 substances were tested, representing the more important and readily obtainable series, though not covering the whole range of simple organic groupings. The toxicity of certain organic compounds apparently depends primarily on their chemical properties and only secondarily on their rates of evaporation. Moore [*R.A.E.*, A, vi, 398] lays more stress on volatility than on chemical constitution, but in many cases this is not applicable. In certain series, such as the hydrocarbons, the toxic values increase with increasing molecular weight, though this is not true of all substances. Solubility in water also apparently plays an important part in the toxic effect of some compounds. Physiological effects are not solely dependent upon any one physical property, although they determine how far matters can go; the chemical properties are the deciding factors. A liquid is generally more certain in action than a solid.

Whether the size of the insect materially alters its resistance has not been definitely ascertained. During the tests the insects were exposed to the vapour for 1,000 minutes in a darkened room at an average temperature of 15° C. [59° F.]. When the concentration of poison was gradually lowered, it was found that at a certain point death did not occur and uncertain results were obtained. Toxicity gradually increased in passing from the lower to the higher homologues until a certain point was reached at which uncertain results were obtained, death sometimes occurring and sometimes not, at saturation concentrations. In such cases anaesthesia might result, but the larvae were usually capable of recovery. This effect is the result of the volatility of the compound being insufficient to produce permanent injury, except to less resistant insects. The aromatic hydrocarbons and halides are on the whole more toxic than the aliphatic hydrocarbons and halides. Compounds such as allyl isothiocyanate, chloropicrin and benzyl chloride, with irritating vapours, have usually a high toxic value which is not closely related to their vapour pressures or rates of evaporation. Chemically inert compounds boiling above 170° C. [338° F.] are generally uncertain in their poisonous effect on wireworms after an exposure of 1,000 minutes at 15° C. [59° F.]. Nearly all organic compounds boiling above 215° C. [419° F.] are uncertain in their action, while those boiling above 245° C. [473° F.] are non-toxic. These limits depend on the resistance of the insect, the length of exposure and the temperature at which the experiment is carried out.

Chapais (J. C.). **L'Aphis du Mélèze.** [Larch Aphis.]—*Nat. Canad., Quebec,* xlvii, no. 9, March 1921, pp. 193–195.

An Aphid, probably *Aphis laricifex,* Fitch, is recorded from American larch (*Larix americana*).

NOTICES.

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McDunnough (J.). **New British Columbia Tussock Moth,** *Hemerocampa pseudotsugata.—Canad. Ent., London, Ont.,* liii, no. 3, March 1921, pp. 53–56.

The synonymy of *Hemerocampa vetusta gulosa,* Hy. Edw., is discussed. The tussock moth attacking Douglas fir in British Columbia, and recorded under this name [*R. A.E.*, A, vii, 212, 479; viii, 481], is now described as a new species, *H. pseudotsugata.*

Fenton (F. A.). **New Parasitic Hymenoptera of the Subfamily Anteoninae (Dryinidae).** — *Canad. Ent., London, Ont.,* liii, no. 3, March 1921, pp. 70–71.

The species dealt with are:—*Epigonatopus americanus,* sp. n., probably a parasite of *Balclutha impicta,* Van Duzee, on *Panicum* sp.; and *Gonatopus agropyrus,* sp. n., and *G. similis,* sp. n., reared from *Deltocephalus affinis* in Iowa.

Lloyd (Ll.). **A Spray for Red Spider on Cucumbers and Tomatoes.**—*Lea Valley & Dist. Nurs. & Growers' Assoc., Cheshunt,* Circ. i, no. 5, April 1921, pp. 1–2.

A spray that is recommended as being a successful remedy for red spider (*Tetranychus telarius*) on cucumbers and tomatos under glass consists of 5 lb. flour and 3 lb. potassium sulphide (liver of sulphur) in 100 gals. of water, applied at the rate of about 1 gal. to every ten full-grown cucumber plants, so that they are well wetted, especially on the undersides of the leaves. In drying, this breaks down the webs so that the mites and eggs become coated with a film, from which they cannot escape. A thin layer of sulphur is left over the foliage, and poisons any mites that have escaped the spray. The effect on cucumber plants is very slight, occasionally scorching a newly opened leaf. It does not harden the foliage as soap sprays are apt to do. The fruit can be marketed the day after spraying. Tomatos, so far as they have been tested, do not seem to be injured by the spray. Two thorough applications should be made, with an interval of a week between them. The preparation of two gallons of the spray is described.

Petherbridge (F. R.). **Observations on the Life-history of the Wheat-bulb Fly** (*Leptohylemyia coarctata,* **Fall.**).—*Jl. Agric. Sci., Cambridge,* xi, pt. 1, January 1921, pp. 99–105, 2 plates.

Observations on *Leptohylemyia coarctata* confirm those of other observers that the worst attacks follow a bare fallow or bastard fallow, and that bad attacks also occur after potatoes, rape, swedes, turnips and mangels. There is only one generation a year; the adults emerge in June and July and oviposit in bare soil, about one-eighth of an inch below the surface, in July, August and possibly September. A few eggs may hatch the same autumn, but the majority hatch the following spring, and the larvae may be found on wheat plants in March and April. The larva bores into the centre of the wheat shoot and feeds at the base of the shoot, causing its death. When fully fed, in the third stage, it enters the soil and pupates about $1\frac{1}{2}$ to 2 inches below the surface. Pupation usually takes place in May.

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BOURNE (B. A.). **Report of the Assistant Director of Agriculture on the Entomological and Mycological Work carried out during the Season under Review.**—*Rept. Dept. Agric., 1919–20, Barbados,* 1921, pp. 10–31.

Plant inspection and fumigation were carried on throughout the year, many consignments being destroyed to prevent the possible introduction of the sugar-cane froghopper, *Tomaspis saccharina,* Dist. (*varia,* F.).

The insects identified during the year included :—the Chalcid, *Euplectrus furnius,* Wlk., bred from larvae of *Protoparce cingulata* ; the Tenebrionid, *Alphitobius piceus,* Ol., on cotton seed from Venezuela ; *Agromyza* sp., mining leaves of cowpeas ; the Lepidoptera, *Perigea albigera,* attacking *Chrysanthemum* leaves ; and *Plutella maculipennis,* on cabbage ; and the Jassid, *Balclutha* sp., on maize.

Diaprepes abbreviatus, L. (sugar-cane root borer) continued to be a serious pest ; the importance of collecting the adults immediately after their first flight is urged, in view of the fact that the numbers of eggs found in each of 12 beetles examined ranged from 294 to 530. *Diatraea saccharalis,* F. (moth borer) caused considerable damage ; care should be taken that only healthy cuttings are planted ; the collection of egg-masses and the preservation of parasites from them has greatly reduced infestation. Minor sugar-cane pests included *Pseudococcus calceolariae, P. sacchari, Aspidiotus sacchari* and the mite, *Tarsonemus spinipes,* Hirst.

Cotton was slightly injured by the leaf blister mite, *Eriophyes gossypii,* Banks, and the stems by the red maggot, *Porricondyla gossypii,* Coq. *Aletia luridula* and *Alabama argillacea* considerably reduced the crop when dusting with Paris green was neglected. During the period of drought, Aphids appeared in numbers, but were soon checked by a lacewing, *Chrysopa* sp., and a Coccinellid, *Cycloneda sanguinea,* L. *Diaprepes abbreviatus* destroyed the roots of many cotton plants on fields formerly used for sugar-cane.

Sweet potatoes (*Ipomoea batatas*) were injured by a serious outbreak of *Protoparce cingulata,* F., in one locality. Though it was apparently absent at first, the Tachinid parasite, *Sturmia distincta,* Wied., finally checked the infestation, assisted by the activities of field mice against the pupae and of blackbirds against the larvae. Thrips and *Tetranychus telarius* (red spider) were also troublesome during the drought, and were controlled by dusting with equal parts of flowers of sulphur and lime.

Laphygma frugiperda, S. & A. (corn-ear worm) did considerable damage to maize. A mixture of equal parts of lead arsenate and hydrated lime, well dusted among the folded leaves of each plant, proved a good remedy. *Plutella maculipennis,* Curt., caused the entire loss of many plantings of cabbages on the southern part of the island. A spray of 3 lb. lead arsenate to 50 gals. of water, with the addition of an adhesive substance, is recommended. *Thrips tabaci,* Lind., attacked shallot (*Allium ascalonicum*), and was controlled by nicotine sulphate. A lace-bug, probably *Corythaica monacha,* was abundant on egg-plants (*Solanum melongena*) ; a spray of 8 lb. fish-oil soap in 50 gals. of water, sprayed on the upper surface of the leaves when the bugs were present, proved a good remedy. Larvae of the Cossid, *Duomitus punctifer,* Hmps., infested whitewood (*Tecoma leucoxylon*), and the branches thus destroyed were pruned off and burnt ; in cases of slight infestation the larvae were extracted with a hooked wire or the burrows were fumigated with carbon bisulphide.

Coccids and Aleurodids included a species of *Pulvinaria* on artichoke that has apparently not been previously recorded from Barbados, and *Orthezia praelonga*, Dougl., *Saissetia nigra*, Nietn., *Coccus mangiferae*, Green, *Vinsonia stellifera*, Westw., *Chionaspis citri*, Comst., *Pseudococcus calceolariae*, Mask., *Aspidiotus sacchari*, Ckll., *Pseudococcus sacchari*, Ckll., and *Aleurodes goyabae*, Goldi, on various fruit trees and garden plants. *Selenaspidus articulatus*, Morg., was frequently found on *Tamarindus indica*, and was apparently checked by the fungus *Hormodendron* sp. *Coccus viridis*, Green, abundant on *Citrus*, was sometimes successfully controlled by the fungus, *Cephalosporium lecanii*. The Chalcids, *Aspidiotiphagus citrinus*, Craw, infesting *Aulacaspis rosae*, Bch., and *Encarsia* sp. attacking *Aleurodes goyabae*, Goldi, exercised a considerable measure of control.

Special investigations into the life-history of *Lachnosterna* (*Phytalus*) *smithi*, Arr., under Barbados conditions, are recorded at length. It is estimated that the loss due to this beetle in one year over 11,666 acres was 7,945 tons of sugar-cane, valued at approximately £33,400. Almost any green foliage is eaten by the beetles, though they seem to prefer leaves of sugar-cane, cassava and roses. Sometimes banana foliage is severely injured. The larvae devour roots of various grasses, particularly sugar-cane, maize, palms, bananas, legumes and rose trees.

Life-history studies show an average length for the stages as follows :—incubation period 13 days, larvae (active) 227 days, pre-pupa 31 days, pupa 17 days, adult life, before emergence, 27 days, from emergence to oviposition 60 days, reproductive period 61 days, post-reproductive period 16 days. The adults fly and feed on the leaves shortly after dusk, remaining underground in the daytime ; the egg, larval and pupal stages are all passed underground. As the life-cycle may vary from 308 to 618 days, there is a great overlapping of broods ; the maximum emergence of adults is during May and June, but emergence may continue until January. The average number of eggs produced by one female was 108. For oviposition and hatching of eggs a certain amount of moisture is necessary; under dry conditions this is obtained by burrowing deeper into the soil. The effect of irrigation has not been studied, but it is thought that the beneficial effect of the green muscardine fungus, *Metarrhizum anisopliae*, would counterbalance the encouragement to breeding of the humid conditions. Many larvae seem to be killed by a bacterial disease, caused by an organism resembling *Bacillus pestis*. The Scoliid parasite, *Tiphia parallela*, which was considered to be an effective check some years ago, no longer seems so efficient, neither is *Dielis dorsata*, F., sufficiently active. The possible effect of certain Nematodes on the eggs is discussed.

It is suggested that there should be rigorous co-operative action on the part of planters in collecting beetles throughout the year. A central insectary should be established for the rearing and distribution of *Tiphia parallela*. Permanent ponds should be constructed on estates for the rearing of the common toad, *Bufo agua*, which is a very useful predaceous enemy of these hard-back beetles. Rotation of crops does much to discourage the insect in infested fields ; cotton is an excellent crop in this respect. Any new parasites of *L. smithi* that are discovered in the future in any country where the hard-back occurs should be introduced into Barbados.

Pink Bollworm Notes.— *Agric. News, Barbados,* xx, no. 494, 2nd April 1921, p. 106.

Reports from Montserrat, where the pink bollworm (*Platyedra gossypiella*) has lately been discovered, indicate that in that island this moth also breeds in okra [*Hibiscus esculentus*]; attempts are consequently being made to provide a close season for this plant to coincide with that for cotton. The pink bollworm has now appeared also in Nevis and St. Croix.

van der Goot (P.). **De Invoer op Java van een nieuw en nuttig Lieveheersbeestje** (*Cryptolaemus montrouzieri*). [The Introduction into Java of a new and beneficial Coccinellid, *C. montrouzieri*.] —*Teysmannia, Batavia,* xxxi, nos. 10, 11–12, 1920, pp. 456–473, 493–510, 2 plates. [Received 27th April 1921.]

The introductory part of this paper deals with the biological method of controlling insect pests in general, and its practical application in Hawaii. A brief notice is given of some attempts in this direction in the Dutch East Indies, and of the work done with *Cryptolaemus montrouzieri* in California and Hawaii.

In 1918 the author introduced this Coccinellid from Hawaii into Java in order to combat the dangerous lamtoro scale, *Pseudococcus virgatus*, Ckll. Honey-water was used for feeding during the forty days journey from Honolulu to Java, where 200 individuals of *C. montrouzieri*, 10 of *Rhizobius ventralis*, and 5 of *Scymnus biguttatus* arrived alive. The last two species died without reproducing themselves, but during June, July and August 1918, *C. montrouzieri* was bred in numbers.

The various stages of this Coccinellid are described. The larvae, especially those of the later instars, are very voracious, and under natural conditions they rapidly clear up *Pseudococcus crotonis* on the leaves of *Castilloa*. The total length of the larval stage ranges from 13 to 23 days, with an average of 20. The pupal stage usually requires 6–9 days. The entire life-cycle from egg to imago requires 22–35 days, with an average of 30. The adults feed before mating, which occurs 5–8 days after emergence. Thus a new generation is present in 4–7 weeks, so that from 7 to 13 generations a year are possible. The number of eggs obtained from a female varied from 64 to 176. The food of the adults is similar to that of the larvae. In the laboratory *Pseudococcus virgatus*, *P. crotonis* and *P. citri* were freely taken. Though well able to fly, the adults show little disposition to spread by this means; this is a disadvantage as regards the speedy control of an outbreak of scales.

In the breeding-cages portions of plants infested with *P. crotonis* were placed as food. The green fruit of *Anona muricata* (custard apple) proved especially suitable after the black ants present had been removed; other material used included cacao twigs infested with the same scale, and cassava stalks with *P. virgatus*.

In June 1918 the first liberations were effected, and observations made since then show that *C. montrouzieri* has been able to breed naturally in Java for two years. Only small numbers have been seen, however, and this seems to be due to the period when food is scarce owing to the decrease of scales during the rainy season. It appears necessary to keep a stock of the Coccinellid ready for immediate increase and liberation at the beginning of the dry season in places where scales are abundant. Without this artificial assistance *C. mon-*

trouzieri cannot become really valuable in the Dutch East Indies. *Pseudococcus citri*, which lives on *Castilloa* and is protected during the rainy season by the broad leaves of that plant, provides the necessary medium for maintaining the stock.

PETERSON (A.). **Some Soil Fumigation Experiments with Paradichlorobenzene for the Control of the Peach-tree Borer,** *Sanninoidea exitiosa,* **Say.**—*Soil Sci., New Brunswick, N.J.*, xi, no. 4, April 1921, pp. 305–318, 1 plate, 1 fig.

The results obtained with sodium cyanide are briefly stated [*R.A.E.*, A, viii, 309], and subsequent experiments with paradichlorobenzene for the destruction of *Aegeria* (*Sanninoidea*) *exitiosa*, Say, are described. This substance gives promise of becoming a valuable and important insecticide for the control of this moth.

For the most part the results of similar experiments agree with those obtained by Blakeslee [*loc. cit.* 189]. In the majority of cases ½ oz. gave as good results as ¾ and 1 oz. with the same exposure, *i.e.*, 21 days or more ; smaller doses than this were, however, unsatisfactory. Trees of six years and over are not seriously injured if the soil is warm at the time of application. Slight injury to the bark may occur. The effect on these trees at a soil temperature of 55° F. or less has not been ascertained. So far no variation in the susceptibility of different varieties of peaches has been noticed. Trees from 3–6 years old were successfully treated with ½ oz. of paradichlorobenzene with a 7 to 10-day exposure, about 80 per cent. of the larvae being killed on the average with a 10-day exposure. Trees treated twice in the summer proved free from borers in the autumn, winter, spring and early summer, while those treated only in June were only free from borers for six to eight weeks following the treatment. Early spring treatment is not advocated owing to the low temperature of the soil. The best time for New Jersey is from 25th August to 10th September. The crystals should be evenly distributed in a circular band between one and two inches from the tree. Should there be any indication of borers in the tree 1 to 6 inches above ground, the soil should be mounded about so that its upper level reaches the highest point where the gum, containing sawdust-like particles, is exuding from the tree. The application is made on this level. The crystals are then covered with soil free from weeds, grass, stones, etc., and this is packed down with the back of a spade.

The present experiments indicate that soil texture does not have much influence on the rate of evaporation, which is, however, retarded should the soil be moist. As a rule evaporation is complete in from 6 to 8 weeks if the temperature of the soil is 60° F. or higher, and the soil moisture is low. Further investigations are needed to determine the influence of moisture in long exposures. High soil temperatures produce greater rates of evaporation than low ones. The ineffectiveness of paradichlorobenzene at low temperatures is probably also partly due to the consequent lower oxygen requirements of the larvae. Fairly satisfactory results have been obtained at temperatures ranging between 55° and 60° F.

PHIPPS (C. R.). **Control of the Pear Thrips.**—*N.Y. Agric. Expt. Sta., Geneva*, Bull. 484, January 1921, 11 pp., 5 plates, 2 figs.

As soon as the adults of *Taeniothrips inconsequens*, Uzel (*pyri*, Dan.) appear in numbers, the ends of the buds should be thoroughly

wetted with miscible oil and nicotine sulphate. The usual time for this application is about the middle or latter part of April in the Hudson Valley. If the infestation is severe, the spray should be repeated in about three or four days. A spray of lime-sulphur and Bordeaux mixture with the addition of $\frac{3}{4}$ pint of nicotine sulphate to every 100 gals. of spray should be applied when the cluster buds are separating. For the destruction of the larvae on the fruit, nicotine sulphate may be added to the usual Bordeaux or lime-sulphur spray, or nicotine sulphate and soap may be used.

FULTON (B. B.). **Insect Injuries in Relation to Apple Grading.**—*N. Y. Agric. Expt. Sta., Geneva,* Bull. 475, May 1920, 42 pp., 4 plates, 2 charts, 17 figs. [Received 28th April 1921.]

The economic importance of insects in crop standardisation depends largely on their destructive influence on crop production. The insects attacking apples are described and grouped according to the injuries they produce. A key is also given for the identification of injuries to mature apples and directions are given for a routine system of spraying.

The insects dealt with are :—*Cydia* (*Carpocapsa*) *pomonella,* L. (codling moth) ; *Enarmonia prunivora,* Wlk. (lesser apple worm) ; *Cydia* (*Laspeyresia*) *molesta,* Busck (oriental fruit moth) ; *Rhagoletis pomonella,* Walsh (apple maggot) ; the green fruit worms, *Graphiphora alia,* Gn., *Xylina antennata,* Wlk., *Graptolitha* (*X.*) *laticinerea,* Grote, and *X. grotei,* Riley ; *Tortrix* (*Archips*) *argyrospila,* Wlk. (fruit-tree leaf-roller) ; *Dichomeris* (*Ypsolophus*) *ligulella,* Hb. (palmer worm) ; *Tortrix* (*Archips*) *rosaceana,* Harr. (oblique-banded leaf-roller) ; *Hemerocampa leucostigma,* S. & A. (white-marked tussock moth) ; *Eucosma* (*Tmetocera*) *ocellana,* Schiff. (bud moth) ; the apple red bugs, *Lygidea mendax,* Reut., and *Heterocordylus malinus,* Reut. ; *Conotrachelus nenuphar,* Hbst. (plum curculio) ; *Anthonomus quadrigibbus,* Say (apple curculio) ; *Aphis sorbi,* Kalt. (rosy apple aphis) ; *Aspidiotus perniciosus,* Comst. (San José scale) ; *Macrodactylus subspinosus,* F. (rose chafer) ; the case-bearers, *Coleophora fletcherella,* Fern., and *C. malivorella,* Ril. ; and *Syntomaspis druparum,* Boh. (apple-seed Chalcid).

McDONALD (R. E.). **The Pink Bollworm in Texas.**—*Mthly. News Bull., Texas Dept. Agric., Austin,* iii, no. 6, April 1921, p. 7.

Referring to a recent article on the pink bollworm (*Platyedra gossypiella*) [*R. A. E.*, A, ix, 269] an appeal is made to cotton growers in Texas to back up the efforts of the State entomologists to combat this pest.

HOULBERT (C.). **Les Coléoptères d'Europe, France et Régions Voisines. Anatomie générale ; Classification et Tableaux génériques illustrés. Vol. I.**—*Paris,* Librairie Octave Doin, 1921, xii + 332 pp., 16 pl., 104 figs. [Price 10 fr. paper, 12 fr. boards.]

This useful handbook is the first of a series of three volumes which aim at giving briefly as complete a summary as possible of the chief subdivisions of the Coleoptera of Europe. The classification of genera is based upon that of Lacordaire (1854–1876), with certain

necessary modifications. An explanation of entomological terminology is included, and each volume will contain an index to its contents, an alphabetical index of the sections, families, subfamilies and genera, and a systematic index. A feature of the volume is a series of excellent figures, illustrating the general characters and types of the families dealt with. Where possible, a few interesting notes on the biology of the family or group are attached. A bibliographical index is also appended.

IATCHEVSKY (A.). **Об Учреждении при Русском Ботаническом Обществе Секции или Отдела Микологии и Фитопатологии.** [On the Establishment of Sections or Departments of Mycology and Phytopathology attached to the Russian Botanical Society.] **—Бюллетень 2-го Всероссийского Энтомо-Фитопатологического С'езда в Петрограде 25-30 Октября 1920 г.** [*Bull. 2nd All-Russian Entomo-Phytopathological Meeting in Petrograd, 25th–30th October 1920*], nos. 2 and 5, 26th and 29th October 1920, pp. 1–2 and 29–32. [Received 30th April 1921.]

The need for a mycological and phytopathological centre has long been felt in Russia. It is therefore suggested that a section or department of mycology and phytopathology in connection with the Russian Botanical Society should be established.

К Вопросу о Работах Местных Энтомологических Станций. [The Question of the Work of Local Entomological Stations.]—**Бюллетень 2-го Всероссийского Энтомо-Фитопатологического С'езда в Петрограде 25-30 Октября 1920г.** [*Bull. 2nd All-Russian Entomo-Phytopathological Meeting in Petrograd, 25th–30th October 1920*], no. 5, 29th October 1920, 32 pp. [Received 30th April 1921.]

One of the initial questions to be discussed at the second meeting of the All-Russian Entomo-Phytopathologists included the problems of existing and future entomological stations. A general programme of work for such stations is outlined by N. M. Kulagin, and a brief account of the work of the Ivano-Voznesensky station is given by A. N. Kazansky.

The following pests for the summer of 1920 were recorded:—*Anthonomus pomorum*, L., *Psylla mali*, Först., and *Cydia pomonella*, L., on apples; and *Emphytus grossulariae*, L., on currants and gooseberries, three generations of this sawfly having occurred. Cabbages were seriously injured by *Pieris brassicae*, L. The second brood was much reduced by parasites, but the numbers increased again in the third and a partial fourth was produced, which is unusual under existing climatic conditions. Flea-beetles caused serious damage to radishes, rape and turnips. Other cabbage pests were *Brevicoryne brassicae*, L., and *Phorbia brassicae*, Bch. Adults of *Loxostege sticticalis*, L., were unexpectedly abundant, but the larvae confined their attention to weeds. *Forficula auricularia* caused serious injury to the foliage of beet, and even of potatoes. *Homoeosoma nebulella*, Hb., was also abundant.

The pests of field crops included the Hessian fly [*Mayetiola destructor*], frit fly [*Oscinella frit*] and *Chlorops taeniopus*, Meig. Potatoes were seriously injured by wire-worms.

The work of the Don Bureau for the control of pests since its inauguration is reviewed by A. N. Buchheim. The director's report by Zvierezomb-Zubovsky for 1919 has been prepared, but not yet printed. The reports for 1917 and 1918, here mentioned, have already been noticed [*R. A.E.*, A, viii, 103–107]. The work of the station was greatly curtailed, and at times completely stopped, during the period of 1918–1920, owing to its position in the centre of war activities.

As practically nothing is known of the plant pests of the south-east of Russia, it is suggested that a specialist should be sent to investigate the districts of Stavropol, Kuban, Terek and the Black Sea.

The pests recorded by Rimsky-Korsakov as observed at the district experiment station at Kniajesky Dvor, are :—*Cephus* sp., on timothy and other grasses (*Calamagrostis epigeios, Agropyrum repens* and *Dactylis glomerata*) ; *Harmolita* (*Isosoma*) spp. on the above grasses, as well as on *Poa pratensis* and *Festuca ovina* ; *Cleigastra* sp. and *Eremobia* (*Hadena*) *ochroleuca* on timothy grass ; *Depressaria depressella* on various umbelliferous plants ; *Pieris brassicae, Brevicoryne* (*Aphis*) *brassicae* and *Phorbia brassicae* on cabbages ; *Acrolepia assectella* and *Crioceris merdigera* on onions ; and *Tetranychus* sp. on cucumbers. Three generations of frit fly [*Oscinella frit*] occurred on oats and winter wheat, also the Hessian fly [*Mayetiola destructor*] on rye, and *Agromyza* sp. on rye and oats. Currants were injured by *Zophodia convolutella*, and apples by *Psylla mali* and *Anthonomus pomorum*. Special observations were made on *Cydia* (*Grapholitha*) *strobilella*, infesting pine cones, and on *Byctiscus betulae*.

This bulletin also contains particulars of courses for the preparation of specialists in economic phytopathology and applied zoology.

General cultural measures for the protection of plants are discussed by D. M. Korolkov, and their application is especially urged in view of the present difficulty in obtaining the appliances required for other remedial measures.

Bogdanov-Katkov (N. N.). **Рапсовый Цветоед** (*Meligethes aeneus*, **F**). —**Петроградская Станция Защиты Растений от Вредителей** [*Petrograd Station for the Protection of Plants from Enemies*], *Petrograd*, 1920, 14 pp., 10 figs. [Received 30th April 1921.]

The Nitidulid beetle, *Meligethes aeneus*, F., is one of the chief pests of cruciferous plants grown for seed in Russia. Its various stages are described. In the Petrograd district the adults emerge from hibernation in the soil from April to May. The plants attacked include *Ranunculus, Crocus reticulatus, Salix, Anemone ranunculoides, Caltha palustris, Viola* sp., rye, wheat, and even fruit trees. Later on, rape, beet, cabbage, mustard, turnips, etc., form the principal food-plants. The adults feed on various parts of the flowers and oviposit in the young flower buds [*R. A.E.*, A, viii, 542]. The eggs hatch in from 10 to 14 days, and the larvae feed on the interior of the buds ; those of later development may also attack the pods. The larvae appear at the beginning of June. Pupation occurs in the soil 3 or 4 weeks later, and lasts about 12 to 15 days. In the district under consideration two generations occur in the year.

The natural enemies are *Malachius aeneus*, F., *Microgaster* sp. and probably *Coccinella septempunctata*, L. The remedial measures advocated [*cf. R. A.E.*, A, viii, 6] include cultural methods, spraying with Paris green and covering the plants with cheese-cloth bags. The latter is also beneficial by preventing cross-pollination.

Bogdanov-Katkov (N. N.). **Петроградское Огородничество и Вредители.** [Petrograd Kitchen Gardening and Pests.]—**Петроградское Огородничество** [*Petrograd Kitchen Gardening*], *Petrograd*, 1921, no. 1, pp. 47–78, 19 figs.

The history and work of the Petrograd station for the Protection of Plants from Pests during 1918–20 is reviewed. The remedial measures adopted are chiefly cultural, but also include spraying and dusting.

The pests dealt with are :—*Phorbia* (*Chortophila*) *brassicae*, Bch. ; *Phyllotreta undulata*, Kutsch. ; *P. nemorum*, L. ; *P. vittata*, F. ; *P. nigripes*, F. ; *Barathra* (*Mamestra*) *brassicae*, L. ; *Plutella maculipennis*, Curt. ; *Brevicoryne* (*Aphis*) *brassicae*, L. ; *Pieris brassicae*, L. ; *P. rapae*, L. ; *Euxoa* (*Agrotis*) *nigricans*, L. ; wire-worms (*Agriotes* and *Athous* spp.) ; *Phaedon cochleariae*, F. ; *Hylemyia antiqua*, Meig. ; *Eumerus strigatus*, Fall. ; *Meligethes aeneus*, F. ; *Polia suasa*, Schiff. ; *P. oleracea*, L. ; *Sitones crinitus*, Ol. ; *S. lineatus*, L. ; *Pionea forficalis*, L. ; *Aphis gossypii*, Glov. ; *Ceuthorrhynchus quadridens*, Panz. ; *C. sulcicollis*, Gyll. ; *C. contractus*, Marsh. ; *Athalia spinarum*, L. ; *Eurydema festivum*, L. ; *E. oleraceum*, L. ; *E. dominulum*, Scop. ; and *Tetranychus telarius*, L.

Couvreur (E.) & Chahovitch (X.). **Sur un Mode de Défense naturelle contre les Infections microbiennes chez les Invertébrés.**—*C. R. Hebdom. Acad. Sci., Paris,* clxxii, no. 11, 14th March 1921, pp. 711–713.

The experiments described were in progress in June 1920 and confirm the conclusions arrived at by Paillot with reference to immunity in invertebrates [*R. A.E.*, A, ix, 234]. They were carried out with the larvae and pupae of *Bombyx* (*Sericaria*) *mori*, both *Bacillus coli* and the organisms of blue pus [*B. pyocyaneus*] being destroyed by the body fluid and digestive juices of this moth.

Paillot (A.). **Rôle des Humeurs dans la Destruction extracellulaire des Microbes chez les Insectes.**—*C. R. Hebdom. Acad. Sci., Paris,* clxxii, no. 14, 4th April 1921, pp. 876–878.

In view of statements in the preceding paper, it is pointed out that the phenomenon of the destruction of micro-organisms by the action of blood and digestive juices of insects *in vitro* is not new, and was only mentioned in a recent paper by the author [*R. A.E.*, A, ix, 234] as an argument in favour of the theory propounded therein.

Couvreur (E.) & Chahovitch (X.). **Contre les Infections microbiennes chez les Invertébrés.**—*C. R. Hebdom. Acad. Sci., Paris,* clxxii, no. 18, 2nd May 1921, pp. 1126–1127.

The criticism of the authors' previous paper [see preceding abstract] is discussed. They do not claim to be the discoverers of the phenomenon of the destruction of micro-organisms by various body fluids in insects, but merely state that the fact occurs.

Paillot (A.). **Influence de la Température sur le Mécanisme de l'Immunité humorale chez les Insectes.**—*C. R. Soc. Biol., Paris*, lxxxiv, no. 14, 23rd April 1921, pp. 737–739.

The results of experiments to ascertain the effect of temperature on the mechanism of the reactions of humoral immunity in insects are described. The modifications resulting from a prolonged low temperature are more easily accounted for if the humoral transformations are admitted to be the result of colloidal reactions between the micro-organisms and certain constituents of the blood than if they are considered to be caused by antibodies or diastasis [*R.A.E.*, A, ix, 234]. The colloidal equilibrium of the blood of caterpillars in a state of immunity is different from that of normal individuals.

Cutler (D. W.). **Observations on the Protozoa parasitic in the Hind Gut of** *Archotermopsis wroughtoni*, **Desn. 1.** *Ditrichomonas* (*Trichomonas*) *termitis*, **Imms. 2.** *Joenopsis polytricha*, **n. gen., n. sp., with brief notes on two new species,** *Joenopsis cephalotricha* **and** *Microjoenia axostylis*. **3.** *Pseudotrichonympha pristina*.—*Qrtly. Jl. Microscop. Sci., London*, N. S. nos. 252, 255 and 258, April 1919, March 1920, and March 1921, pp. 555–588, 383–410 and 247–264, 8 plates, 11 figs.

The contents of these papers are indicated by their titles.

Order made by the Governor-in-Executive Committee under Sections 45 and 46 of the Trade Act 1910 (1910–16), Barbados.—*MS. from Colonial Office*, 30th April 1921.

This order, dated 2nd September 1920, prohibits the importation into Barbados of cotton seed or cotton lint except when accompanied by a permit from the Director of Agriculture and a certificate stating that the permit is in order and listing all insect or fungous pests of cotton known to exist in the locality to which the permit relates. The method of obtaining such a permit is described, the particulars required being the name and address of both exporter and importer, and the country or locality where the seed or lint was grown. Before being landed, any cotton seed or cotton lint must be subject to fumigation or other treatment required by the Director of Agriculture. Goods of any other description shipped in the same vessel as cotton seed may also be required to be fumigated, and may not be landed without the consent of the Director of Agriculture.

Departmental Activities: Entomology.—*Jl. Dept. Agric., Union S. Africa, Pretoria*, ii, no. 4, April 1921, pp. 301–306.

The Coreid bug, *Holopterna valga* (tipwilter), is very troublesome in gardens, particularly on dahlias and sunflowers, and is found on the veld on small yellow composites; the only remedy is to knock the bugs from the plants into a can of water and paraffin oil, and this should be done in the morning, when the insects are sluggish. The fruit-fly [*Ceratitis capitata*] has, on the whole, been less destructive than in the previous year, but in February yellow peaches were badly infested. The mite infesting tomatos has been the main cause of failure of the summer crops; while no remedy has been found for the pest, the application of nicotine extract or very dilute lime-sulphur

may arrest its spread in its early stages. The larva of the moth *Euzophera villora* has recently come into notice as a potato pest, boring in the stems and tubers and riddling them with galleries. Caterpillars of *Sesamia calamistis*, Hmps., considerably damaged wheat, which ripened prematurely; and they also attacked barley and oats. *Lema bilineata* (tobacco slug) has recently been recorded from Middelburg, Transvaal [*cf. R. A.E.*, A, ix, 186, 229].

Extensive outbreaks of locusts are expected in many of the Karroo districts, and farmers are urged to be on the watch and to report any observations of oviposition. About 1,500 swarms are reported to have been destroyed in the Graaff-Reinet district alone, but complete eradication was impossible, and swarms arising from individuals that escaped the poisoning are now widespread. The chief movement has been from west to north.

The establishment of the parasite [*Aphelinus mali*] of the woolly apple aphis [*Eriosoma lanigerum*] received a check owing to the Aphid almost dying out in February; with its reappearance in March, however, the parasites were found in numbers. Outbreaks of the mystery worm [*Laphygma exempta*] have been reported in the low veld of the Transvaal, and later outbreaks are expected in the high veld. For cheese mites in factories, about which many complaints have been made, there is no easy method of destruction, owing to their power of surviving for an almost indefinite period in the absence of food. Infested rooms should be cleaned out thoroughly, fumigated with sulphur at the rate of 2 lb. to every 1,000 cu. ft., and then washed with strong soap solution.

Coccotrypes dactyliperda, F. (vegetable ivory beetle) damages the buttons made from so-called vegetable ivory, which is the hard seed of the palm, *Hyphaene crinita*. In stores, buttons on ready-made garments kept in exposed places are the most damaged, while those kept in closed packages are not attacked. All stages of the beetles may be found together in the buttons, which are eaten out until only a shell is left. Fumigation is hardly practicable in clothing stores, and there is no assurance that reinfestation will not occur. It is suggested that the buttons might be made proof against attack by incorporating some poisonous substance with the material with which they are coated.

A list is given of miscellaneous minor pests of orchards, gardens, etc.

DAVIS (J. J.). **Orchard Insect Problems.**—*Hoosier Horticulture, Indiana Hortic. Soc., La Fayette,* iii, no. 2, February 1921, pp. 19–24. [Received 2nd May 1921.]

The essential factors in insect control in orchards include an accurate knowledge of its importance and relation to profitable fruit-growing. Only those recommendations should be followed in Indiana that are suitable for conditions in that State. The importance of general care of the orchard by following only the best practices and of thoroughness in spraying is emphasised. Many small, privately-owned orchards in Indiana are very much neglected and prove a continual source of reinfestation to neighbouring large commercial ones.

Among the most important fruit-tree pests are the codling moth [*Cydia pomonella*], which has two generations annually in Indiana, with possibly a third or partial third in certain years. As these overlap, spraying should be continuously carried on at intervals of about two

weeks from the first summer spray until about mid-August. The first two summer sprays are, however, the most important. The plum curculio [*Conotrachelus nenuphar*] is difficult to control, but its occurrence can be largely prevented by cultural practices. As hibernation occurs in the adult stage under leaves or rubbish, the elimination of these hibernating places and the maintenance of good cultivation will greatly reduce the number of weevils, while cultivation of the ground from about 10th July to 20th August, that is after the larvae have entered the soil for pupation, will destroy many of the pupae. These practices, together with the first two sprays for *C. pomonella*, should destroy the insects almost entirely.

For Aphids and scale-insects the recognised remedy is a dormant spray of lime-sulphur or miscible oil for the latter and a nicotine extract with the first summer spray for the former. The value of the delayed dormant spray is discussed ; it is considered decidedly satisfactory as an annual practice in Indiana, but its use requires considerable judgment, and it is not recommended for universal application until it has been more thoroughly studied.

The peach-tree borer [*Aegeria exitiosa*, Say] is being successfully controlled by paradichlorobenzene [*cf.* *R.A.E.*, A, ix, 325]. This method is largely used in the peach-growing districts in Georgia.

CAMUÑAS (M.). **Report of the Commissioner of Agriculture and Labour.**—*19th Ann. Rept. Gov. Porto Rico to Secy. War, Washington, D.C.*, 1919, Appendix ix, pp. 685–707. [Received 4th May 1921.]

Experiments with paraffin emulsion sprays against pests of *Citrus* show that two successive sprayings at an interval of one to two weeks are required for the control of scale-insects, the same results being obtained against *Pseudococcus nipae*, Mask., on guava. It is doubtful if the Yothers oil emulsion spray can be increased sufficiently in strength to control mealy-bugs without injury to the trees.

The pests of *Citrus* recorded for the year under review included : *Vinsonia stellifera*, Westw. (star scale), which, in common with the black scale [*Saissetia oleae*], was heavily parasitised by the fungus, *Aschersonia turbinata*, this scale also occurring on mango, coconut, etc. ; and a leaf-hopper, *Ormenis pygmaea*, F., found for the first time on *Citrus*, and also breeding on *Cordia corymbosa*, *C. cylindrostachya*, young coffee foliage and passion-fruit vine, which is parasitised by *Metarrhizium anisopliae* Other *Citrus* pests are an undetermined thrips, two mealy-bugs—probably *Pseudococcus gahani* (*citrophilus*) and *P. longispinus*—a bagworm, and the larvae of an Arctiid moth. Several mealy-bugs, including *P. gahani*, were attacked by the larvae of a Micropterygid moth. During May some of the trees were greatly infested with the citrus leaf-roller, *Eantis thraso*, Hb. Adults of a Fulgorid, *Bothricera* sp., were common on twigs of grapefruit, and were also seen feeding on sugar-cane in March.

Experiments are now in progress in connection with insects involved in the transmission of mottling disease of sugar-cane. Among the numerous sugar-cane plants subjected to the attacks of insects previously fed on infected ones, only two exhibited the disease. The insects responsible for the transmission were *Stenocranus saccharivorus*, Westw. (cane fly) and *Aclerda tokionis*, Ckll. (sugar-cane leaf scale)

Watson (J. R.). **Insect Damage to Crops in Florida.**—*Qtrly. Bull. Florida State Pl. Bd., Gainesville,* v, no. 3, April 1921, pp. 138–140.

Besides the direct loss of crops due to insect attack in Florida, there is a good deal of indirect loss caused by hindrance to the development of industries from fear of insect pests. It is thought that the average loss, as estimated for the United States—about 42*s*. per year for each individual—is too low for Florida, where growth continues all the year round without any prolonged and severe winter to kill off insects. The average plantations of *Citrus* probably yield only one-half of what they might produce if freed from insect pests ; only in the best-cared-for groves is the loss much less. Winter vegetables do not suffer very severely, as many insects are hibernating during the period of their growth, but vegetables grown in autumn and spring are often badly attacked. Late-planted maize frequently fails owing to insect attacks. Some instances are given of the control of insect pests by entomogenous fungi and by introduced parasites, and the importance of discovering and propagating fresh natural enemies is emphasised.

Berger (E. W.). **Natural Enemies of Scale Insects and Whiteflies in Florida.**—*Qrtly. Bull. Florida State Pl. Bd., Gainesville,* v, no. 3, April 1921, pp. 141–154, 10 figs.

The climate of Florida is very favourable to the development of certain fungi, which are of great assistance in keeping down the scale-insects that infest *Citrus*. The Plant Board of Florida grows and supplies pure cultures of these fungi with instructions for applying them to the trees. Their importance is soon apparent if a tree is sprayed with a fungicide, such as Bordeaux mixture ; this destroys the fungi, and the scale-insects rapidly increase in consequence. Artificial dissemination is best carried out during the summer rains, but the use of fungi is not recommended for trees less than three years' old. These are better sprayed with oil, and a spray of oil emulsion, miscible oil or soap solution is recommended towards the end of September on all trees where scales seem to be increasing. The fungi may be applied by spraying a mixture of the spores in water into the trees. For whiteflies this must be applied to the lower side of the leaves. About 100 heads of fungus should be used to one gallon of water. Fungi not obtainable in pure cultures should be collected from deciduous trees when wanted for use on *Citrus*, or vice versa.

These beneficial fungi include the red-headed scale-fungus, *Sphaerostilbe coccophila,* which infests *Lepidosaphes beckii* (purple scale) on *Citrus, Aspidiotus perniciosus* (San José scale) chiefly on peach, plum and pear, *L. gloveri* (long scale) on *Citrus, A. hederae* chiefly on chinaberry, and *Parlatoria pergandei* (chaff scale) mainly on *Citrus*. The pink scale-fungus, *Microcera fujikuroi,* greatly resembles the above and has long been confused with it. It attacks *Chrysomphalus aonidum* (Florida red scale) mainly on *Citrus, C. obscurus* (water-oak scale) and *C. tenebricosus* (red maple scale) on their respective food-plants, and *C. aurantii* (California red scale) and *L. beckii* on *Citrus*. The white- or grey-headed scale-fungus, *Ophionectria coccicola,* is very commonly found on *L. gloveri, L. beckii* and *P. pergandei*. The black scale-fungus, *Myriangium duriaei,* which probably occurs throughout Florida, but is more abundant in the north, kills *L. beckii, L. gloveri,*

P. pergandei, *A. perniciosus*, and *A. ancylus*, the latter mainly on pecan. The Cuban species, *Aschersonia cubensis*, infests *Toumeyella liriodendri* on banana shrub and magnolia, *Pulvinaria pyriformis* on guava, swamp bay (*Tamala pubescens*), *Ilex cassine*, avocado, camphor, cinnamon, etc., and *Eucalymnatus tessellatus* on mango from Porto Rico. The turbinate fungus, *A. turbinata*, controls *Ceroplastes floridensis* (Florida wax scale), which infests *Citrus* and many other plants.

The red whitefly-fungus, *A. aleurodis*, is an important factor in the control of *Dialeurodes citri* (common whitefly) and *D. citrifolii* (cloudy-winged whitefly) on *Citrus*, and has also been found infesting a whitefly, probably *Bemesia inconspicua*, on sweet potato and an unidentified black Aleurodid. The yellow whitefly-fungus, *A. flavocitrina*, is very effective against *D. citrifolii*. The brown whitefly-fungus, *Aegerita webberi*, infests *D. citri* and *D. citrifolii*, and continues to thrive late in the season after the dry weather has begun. The white fringe fungus, which is an unidentified species of *Microcera*, is so universally present, destroying the larvae of *D. citri* and *D. citrifolii* whenever weather conditions are favourable, that its artificial propagation has not been undertaken. The cinnamon fungus, *Verticillium heterocladum* is widely distributed on whitefly larvae and the scales *P. pergandei*, *L. gloveri*, *L. beckii*, and others.

The principal predators of scale-insects and whiteflies are the Coccinellids, *Novius cardinalis*, introduced from Australia ; *Chilocorus bivulnerus*, feeding chiefly on the armoured scales ; *Delphastus catalinae* and *D. pusillus*, which feed on the eggs of whiteflies ; and *Cycloneda munda* and *Hippodamia convergens*, which devour some scales, though their preferred food is Aphids. Other predaceous enemies are the Tenebrionid beetle, *Epitragus tomentosus* ; the larvae of *Chrysopa* spp. (lace-wing flies) and *Hemerobius* spp. ; a Pyralid larva, *Laetilia coccidivora* ; and Syrphid larvae.

Parasites are numerous, particularly in colonies of *Coccus hesperidum* (soft brown scale), and include Braconids and Chalcids, such as *Eretmocerus haldemani*, which effectively controls the woolly whitefly, *Aleurothrixus howardi*. The Agromyzid fly, *Cryptochaetum monophlebi*, introduced from Australia, is very efficient in destroying the cottony-cushion scale [*Icerya purchasi*].

CHAFFIN (J.). **Mealy-bugs.**—*Qtrly. Bull. Florida State Pl. Bd., Gainesville*, v, no. 3, April 1921, pp. 154–158.

Nearly every fruit and plant grown in Florida is attacked by mealy-bugs, which are very serious pests of *Citrus*, and do considerable damage in greenhouses and ornamental nurseries, and sometimes attack the roots of peanuts, cowpeas and other plants. Many of them are destroyed by natural enemies, such as the caterpillars of *Laetilia coccidivora*, several species of Coccinellids, and the larvae of Syrphids and lace-wing flies [*Chrysopa* spp.]. It is during dry seasons in spring and summer that the greatest damage is done in *Citrus* groves. Grapefruit is the preferred food-plant, oranges and other species of *Citrus* also being attacked.

There are some 50 species of mealy-bugs in Florida, but only a few of them have any economic importance. The chief is *Pseudococcus citri*, which occurs throughout the State, and is most injurious to *Citrus*, besides attacking numerous other plants ; there are often as

many as four generations in Florida, and each female lays some 300 to 500 eggs. Ants frequently accompany them and are a great protection against enemies. *P. longispinus* (long-tailed mealy-bug) attacks *Citrus*, but is less widely distributed, is held more in check by its natural enemies, and is less protected by ants. It apparently prefers greenhouse plants, particularly palms, and also attacks avocados, mangos and oleanders. *P. bromeliae* (pine-apple mealy-bug) is occasionally found on *Citrus*, generally on nursery stock or tender twigs, but prefers pineapple or banana. *P. nipae* (coconut mealy-bug) is abundant on many tropical plants in South Florida, preferring guava, palms and avocado in nurseries. *P. solani* is found on the roots of cowpeas, peanuts and ragweed, but is of little economic importance. Other minor pests are *P. saccharifoliae*, found on sugar-cane in South Florida, *P. virgatus* on oleander and other ornamental plants, and *Ericoccus quercus* on oak or gallberry. *Trionymus quaintancei* is widely distributed over the State, and occurs on the roots of sumac during the entire year.

A simple remedy against mealy-bugs is to wash them off the trees with a spray of clear water, but a pressure of 200 to 250 lb. is necessary for this to be effective. If only a small sprayer is used, some strong insecticide, such as 1 lb. whale-oil soap to 5 U.S. gals. of water, or an oil insecticide about one-third or one-fourth stronger than is used for whiteflies or scale-insects, should be employed, a second application being given about two weeks after the first. After spraying the trees, all ants' nests in the vicinity should be destroyed by thrusting into them a piece of cotton saturated with carbon bisulphide, or by pouring in a mixture of 4 oz. sodium cyanide to 1 U.S. gallon of water.

A Spray Schedule for *Citrus.—Qtrly. Bull. Florida State Pl. Bd., Gainesville,* v, no. 3, April 1921, pp. 159–160.

This schedule was issued as the result of a conference of entomologists and others. A list of 10 sprays is given for grape-fruit and oranges, with materials, times of application and instructions for their use.

Pettit (R. H.). **Report of the Entomological Section.**—*58th Ann. Rept., 1918–19, Michigan State Bd. Agric., East Lansing,* 1920, pp. 270–272. [Received 4th May 1921.]

Among unusual insects that occurred during the year under report, the clover Jassid, *Agallia sanguineolenta*, destroyed as much as three-fourths of the crop in some fields. The high, dry land in the southern part of the State was the most severely infested. The potato Jassid causing tip-burn [*Empoasca mali*] was abundant in the late summer of 1918. Tip-burn did not occur when nicotine sulphate sprays were employed before the leaf-hoppers acquired wings. As the insects hibernate under rubbish, the destruction of all refuse in late autumn, after the cold weather begins, is the best means of gaining permanent control. *Philaenus leucopthalmus* var. *fasciatus* deposits masses of spittle on clover in the fields, but does not seem to cause any injury. The corn root-aphis [*Aphis maidiradicis*] was present in unusual numbers owing to the upsetting of the normal crop rotation. When maize is sown after spring-ploughed grass, this Aphid generally appears in Michigan, because ants have established themselves in the grass sod and later foster the Aphids. This unusual crop rotation

also encouraged a Crambid moth that was injurious to young maize. The army worm [*Cirphis unipuncta*] was numerous all over the State after a cold, wet spring. *Agrotis* (*Noctua*) *fennica* (erratic army worm) was present in recently cut-over land and in gardens made on such land. Young grasshoppers have been very injurious for several years in certain counties, and an active campaign is being carried on against them. The poison-bait used consists of 1 bushel of hardwood sawdust, 1 lb. white arsenic, 1 lb. (or less) salt, $\frac{1}{2}$ pint molasses, and sufficient water to make a stiff mash. This is an inexpensive mixture and seems to be proving successful. Many grasshoppers are also being attacked by a species of *Trombidium* (red mite).

A careful watch is kept on all borers in maize, owing to constant fear of the introduction of the European corn borer [*Pyrausta nubilalis*]. *Papaipema nebris* (*nitela*) (common stalk borer), some Crambids and *Hadena fractilinea* all occur. The 17-year cicada [*Tibicen septemdecim*] appeared, as was expected, but in smaller numbers than ever before. Sawfly larvae were numerous on cherries and pears, and as the first generation appears while cherries are ripening, arsenicals cannot very well be used, but the second generation, which appears in August, should be destroyed, so that the trees may be safe in the following year. The Hessian fly [*Mayetiola destructor*] is increasing in Michigan, especially in the southern half of the State where the seed has been sown early. A repetition of this practice in the following year would result in serious loss.

PETTIT (R. H.) & MCDANIEL (E.). **The Wheat Joint-worm.**—*58th Ann. Rept., 1918–19, Michigan State Bd. Agric., East Lansing,* 1920, pp. 272–277, 8 figs. [Received 4th May 1921.]

Outbreaks of *Harmolita* (*Isosoma*) *tritici* (wheat joint-worm) have been experienced in Michigan in 1884, 1906 and 1918. All were widespread, but that of 1918 was accompanied by numbers of *H.* (*I.*) *vaginicola* (wheat sheath-worm). There is only one generation of *H. tritici* in a year, eggs being laid on the new, tender growth. The larvae soon produce thickening of the straws, those so attacked seldom producing their full weight of grain. As hibernation occurs in the stubble, deep ploughing immediately after the harvest would destroy most of the insects. The custom of using wheat as a nurse crop for clover prevents this, and therefore other crops that are immune to the joint-worm should be substituted for a year or so. Barley is often badly attacked, and therefore rye, the only other grain crop attractive to Michigan growers, is generally used, though this also is sometimes slightly attacked. The wheat should be cut low, as most of the insects present in it will be killed by the separator. Another method is to cut high and leave the old, dead straws to rot at their base and then comb them out with a side delivery rake and destroy by fire. Wheat should never be sown to follow a wheat crop during an outbreak.

Parasites of *H. tritici* reared during the 1918 infestation were *Ditropinotus aureoviridis, Homoporus chalcidophagus, Eupelmus alynii Eupelminus saltator* and *Eridontomerus pruinosa.* Later in the season *Eurotoma bolteri* was also obtained. In 1919 the infestation was again widespread, but much less severe than in the previous year. *H. vaginicola* was numerous, especially in the eastern part of the State, and caused possibly more damage than in 1918, while very few parasites were reared from this species.

WALTON (W. R.). **Entomological Drawings and Draughtsmen: their Relation to the Development of Economic Entomology in the United States.**—*Proc. Ent. Soc. Washington, D.C.*, xxiii, no. 4, April 1921, pp. 69–99.

The limitations of photography, as compared with drawing, even at the present time, are such that well-drawn illustrations play a very important part in entomological work; in the past this was so little recognised that many of the artists who have done much for entomology are almost forgotten. This paper gives a short account of those draughtsmen who have worked in America. The field of entomological drawing, and the relations that should exist between the artist and the entomologist whose work is being illustrated are also considered.

WALLACE (F. N.). **Report of the Division of Entomology.**—*1st Ann. Rept. Indiana Dept. Conservation, 1st April–30th September 1919, Indianapolis,* 1920, pp. 40–53.

The nursery and import inspection work is reviewed and a list given of Indiana nurserymen. San José scale [*Aspidiotus perniciosus*] was more abundant than for several years, probably owing to the mild winter. The importance of the dormant spray against this pest is emphasised; lime-sulphur should be used at the rate of 1 gallon to 5 or 6 of water. Chinch bugs [*Blissus leucopterus*] appeared in numbers in wheat and maize fields, doing considerable damage. The central and northern parts of the State suffered from invasions of the army worm [*Cirphis unipuncta*], of which there are two generations annually in Indiana. Hibernation generally occurs in the pupal stage, and the moths emerge in the spring to oviposit on grasses, etc. Wheat, rye and timothy were the crops most seriously attacked. The second generation seldom causes much damage. A parasitic fly destroys very many of the larvae before they reach maturity.

WALLACE (F. N.). **Report of the Division of Entomology.**—*2nd Ann. Rept. Indiana Dept. Conservation, Year ending 30th September 1920, Indianapolis,* 1921, pp. 273–284. [Received 9th May 1921.]

Among the most serious pests in Indiana in 1920 were chinch bugs [*Blissus leucopterus*], which were more injurious than for many years past. A very successful protection for maize fields is a narrow ridge of straw, 3 to 5 inches wide, laid down between the rows of maize next to infested fields, heavy oil being poured over the straw. The insects cannot cross the straw until the oil evaporates, and if another oiling is given five or six days later, they will all be starved to death. One gallon is sufficient for 25 to 30 ft. of straw barrier. Infested maize should be sprayed with 3 lb. fish-oil soap, 1 U.S. pint Blackleaf 40, or $1\frac{1}{2}$ pints nicotine oleate to 50 U.S. gals. of water. The Coccinellids, *Hippodamia convergens*, Guer., *Coccinella novemnotata*, Hrbst., *H. parenthesis*, Say, and *Megilla maculata*, DeG., were found feeding on the eggs and on bugs in the first and second stages. Weather conditions have been very favourable for the bugs going into hibernation, and unless many die during the winter there will be a very serious outbreak in 1921. Hibernation frequently occurs in grasses and sedges, and along fence rows and ditches at the roots of grasses; if these are burned over, many will be killed and others will die from exposure. Sometimes the bugs hibernate in numbers in maize husks; when this occurs, the maize should be husked and the fodder removed and used as soon as possible.

The grape-vine flea-beetle [*Haltica chalybea*] caused much damage during 1919–20. Hibernation occurs in the adult stage under debris near grape-vines, and in the spring, just when the buds are ready to burst, the beetles eat out the insides, causing a loss in foliage and fruit that is out of all proportion to the actual food consumed. Oviposition lasts about a month, and the incubation period is three weeks to two months, according to the temperature. The young larvae eat small holes in the lower surface of the leaves and, later, feed on the upper surface and on the blossom clusters, sometimes ruining the entire crop. The larvae are mature after about three weeks, and pupate in the ground, adults emerging about one month later. The adults feed on the foliage until the autumn, when they hibernate. The remedies suggested are spraying the vines in the spring, as soon as the buds swell, with Bordeaux mixture, 4 : 4 : 50, adding 2 lb. lead arsenate to every 50 U.S. gals. of the mixture. Another application should be made after the foliage is out, but before the flower-buds open, and again after the fruit is set.

Oyster-shell scale [*Lepidosaphes ulmi*] is spreading alarmingly in Indiana, attacking forest trees as well as shade and ornamental trees. The three forms found in Illinois [*R. A.E.*, A, viii, 305] all occur; the brown form, on apple, has two generations, but is not a serious pest. The light brown form does not attack apples, but is a serious pest of lilac, red and yellow osier, dogwood, elm, ash, cottonwood, soft maple, *Rosa rugosa*, etc.; it has two generations and is the commonest form, only about 10 per cent. of the scales being parasitised. The greyish-brown form is a pest of various shade and ornamental trees; it has only one generation in a year and is not heavily parasitised. The remedy that has proved successful against these scales is a spray of 1 lb. fish-oil soap to 4 U.S. gals. water, adding 1 oz. Blackleaf 40 to every 4 gals. of solution. This should be applied just after the young scales have hatched.

The Hessian fly [*Mayetiola destructor*] was able to do considerable damage owing to wheat being planted while the midges were still active. Climatic conditions in different parts of the State have caused much variation in the time of emergence ; if this is carefully observed and late sowing is practised, the pest should be reduced to a minimum.

A record is given of apiary inspection during the year, which shows a great decrease in disease among bees.

IMMS (A. D.). **Isle of Wight Disease in Hive Bees.**—*Nature, London*, cvii, no. 2687, 28th April 1921, pp. 283–284.

The literature on Isle of Wight disease of bees is reviewed. Information with regard to the mite, *Acarapis* (*Tarsonemus*) *woodi*, as the causal agent, has already been noticed [*R. A.E.*, A, ix, 275].

HIRST (S.). **On the Mite (*Acarapis woodi*, Rennie) associated with Isle of Wight Bee Disease.**—*Ann. Mag. Nat. Hist., London*, vii, no. 42, June 1921, pp. 509–519, 7 figs.

The external structure and affinities of the mite, *Acarapis woodi*, Rennie, the causal agent of Isle of Wight disease in bees, are described.

As there is no free nymphal stage in either *Acarapis* or *Tarsonemus*, the disease is probably spread by the adult stage. The mites live for several days after the death of the bee and finally die in the body of

the host. In one case a male of *Tarsonemus* (*sens. str.*) was found in the trachea of a bee, proving that more than one species of mite of this family may enter the respiratory system of *Apis mellifica*. A species of *Tarsonemus* has also been found in *Apis dorsata*, *A. florealis* and *A. mellifica* var. *indica* from India.

TAUBENHAUS (J. J.). **A Study of the Black and the Yellow Molds of Ear Corn.**—*Texas Agric. Expt. Sta., College Station*, Bull. 270, October 1920, 38 pp., 10 plates. [Received 10th May 1921.]

An investigation into black mould (*Aspergillus niger*) and yellow mould (*A. flavus*) has revealed that the former invariably starts on maize at the point where an insect, especially the corn ear-worm, *Heliothis* (*Chloridea*) *obsoleta*, has penetrated through the husk into the ear. The insect in feeding produces a considerable quantity of moist excrement that offers an excellent medium for *A. niger*. In young, tender ears the fungus spreads rapidly to the entire inner surface, but in partly ripened ears infection will remain localised within the feeding area of the insect. Thoroughly ripened ears are seldom infected, for at this stage they are practically free from ear-worms. There are other insects, as well as rodents and birds, that may open the way to infection by *A. niger*. Experiments have proved that *H. obsoleta* frequently carries on its body spores of *A. niger* and *A. flavus*. Both organisms are also frequently found on cotton bolls that have been attacked by *H. obsoleta*, and *A. niger* also on tomatos injured by this moth, though it does not seem to cause decay so long as the fruit is in a green and growing condition.

Since *A. niger* can only invade maize during the milky stage, and after attack by *H. obsoleta*, it follows that the disease will be most prevalent in seasons when the caterpillars are most numerous, that is, generally speaking, in dry seasons, and also that the remedy for black mould is control of the corn ear-worm. Cultural methods will check the numbers of *H. obsoleta* to a great extent, and the cultivation of varieties of maize that are inattractive to the insect is recommended. As a preventive against yellow mould, only those varieties of maize that have pendant ears should be planted, especially in localities with a heavy rainfall.

SMITH (H. S.). **Biological Control of the Black Scale in California.**—*Mthly. Bull. Cal. Dept. Agric., Sacramento*, x, no. 4, April 1921, pp. 127–137, 5 figs.

Saissetia oleae, Bern. (black scale) is the worst pest of *Citrus* in California, where it is widely distributed. This scale has been largely controlled by fumigation with sodium cyanide, but the enormous expense of this method and of the washing of the fruit, and the apparent decrease in effectiveness of recent fumigations, has indicated the desirability of substituting control by means of natural enemies. An attempt was made in 1913 to introduce parasites from South Africa, but their establishment was unsuccessful. *Aphycus lounsburyi*, one of the most important parasites occurring in Africa, has, however, since been introduced from Australia, thus forming a sequence of natural enemies with the Coccinellid, *Rhizobius ventralis* and the egg-parasite, *Scutellista*. Two insectaries have been established for the rearing of *A. lounsburyi*. It was found that the method of handling the parasite must be made to correspond with the seasonal

history of *S. oleae.* The scale, in California, has two distinct types of development, the even hatch, when development is characterised by a uniform generation of black scale, and uneven hatch, when the scale is found in all stages at any season of the year. A chart shows the relative development of the black scale and its parasite. Under the former type of development the parasites are active from February to July. By July all the parent scales are dead, and only the young ones survive. These are too small to serve as a host for the parasite until after the second moult, in the following February; consequently there are six months when there is no available host for the parasite. It is obvious that, under these conditions, heavy liberations of parasites must be made as soon as the scales become vulnerable, especially as the effectiveness of the parasite depends upon the number of generations it can produce to one generation of the scale. These conditions of even hatch, moreover, occur over the greater part of the citrus regions of southern California. The problem is therefore to discover an economical method of rearing large numbers of the parasites for liberation at the opportune moment each year, since they cannot maintain life in the citrus orchards in any numbers from year to year. A method that shows considerable promise is the production of potato sprouts in individual containers and the stocking of these with scales, parasitising them with *A. lounsburyi*, and then distributing the sprouts in the orchards; this eliminates any handling of the individual parasites. Citrus or pepper-tree cuttings infested with scale can be similarly parasitised and returned to the orchards. It is thought that this method will prove far more economical than fumigation.

A further problem that requires attention is the eradication of the Argentine ant [*Iridomyrmex humilis*] from the orchards; this must be accomplished before the best results can be obtained from the use of natural enemies.

Essig (E. O.). **Some interesting Economic Insects recently observed in California.**—*Mthly. Bull. Cal. Dept. Agric., Sacramento,* x, no. 4, April 1921, pp. 140–143, 3 figs.

Spermophagus pectoralis, Sharp (Mexican bean weevil) is somewhat similar to *Bruchus* (*Acanthoscelides*) *obtectus,* Say (bean weevil) in appearance and habits of infesting stored beans, but is perhaps more destructive, as it breeds in great numbers throughout the year. A Hymenopterous parasite of it has been reared. *Ceroplastes cirripediformis,* Comst. (barnacle scale), usually a greenhouse pest, has recently been taken in citrus orchards. *Chrysomphalus dictyospermi,* Morg., one of the most serious scale-insects attacking *Citrus* in Spain, has been taken on ornamental palms, chiefly *Kentia* spp. in greenhouses, and has caused the death of young avocado trees. The Nitidulid, *Carpophilus dimidiatus,* F., frequently occurs on sour and decaying fruit in southern California, and in the flowers of *Opuntia* spp. It has recently been found infesting shelled peanuts from Java, in company with *Tenebroides mauritanicus,* L. (cadelle), *Tribolium castaneum,* Hbst. (red flour-beetle), *Silvanus surinamensis,* L. (saw-toothed grain beetle), and *Plodia interpunctella,* Hb. (Indian meal-moth). Another moth, *Aphomia gularis,* L., has been taken in shelled peanuts from China. *Lasioderma serricorne,* F. (cigarette beetle) has adapted itself to copra and copra cake, which it is seriously infesting. Other insects taken on copra are *S. surinamensis, T. castaneum,* and *Necrobia rufipes,* F.

Penny (D. D.). **A Skin-feeding Tortricid** (*Cacoecia franciscana*, **Walsingham) injurious to Apples in the Pajaro Valley.**—*Mthly. Bull. Cal. Dept. Agric., Sacramento,* x, no. 4, April 1921, pp. 146–150, 3 figs.

The Tortricid, *Tortrix* (*Cacoecia*) *franciscana*, Wlsm., has been noticed for several years past to cause damage to apples at picking time and while in storage during the winter. The stages of this moth are described. The most evident injury consists of a peeling of the skin of the apple by the larvae. These often web themselves into protected places, such as folded leaves or leaves webbed to twigs or fruit. The stem and blossom ends of the fruit are particularly affected, while apples in boxes are frequently injured at the point of contact of two or more apples. The life-history is not fully known, but there is an irregular appearance of larvae in late summer and autumn, and these live through the winter as full-grown or partly grown larvae, in any sheltered hiding-place on the tree. They continue to feed to some extent on the very small twigs and buds, pupating and appearing as adults in the following spring. There is a fairly even appearance of larvae in the spring, against which remedial measures should be directed. Some new treatment must be devised, as *T. franciscana* escapes all the ordinary sprays at present in use in the locality. Other Lepidopterous pests frequently associated with *T. franciscana*, and often confused with it owing to their similarity in appearance and habits, are *Pandemis pyrausana*, Kearf., and *Peronea* sp.

Mackie (D. B.). **A Report of some Observations on the Work of the Arizona Authorities in Connection with the Thurberia Weevil.**—*Mthly. Bull. Cal. Dept. Agric., Sacramento,* x, no. 4, April 1921, pp. 150–158, 1 map.

In view of the reported appearance of *Anthonomus grandis* var. *thurberiae* (Thurberia weevil) in fields of cultivated cotton in the Tucson district of Arizona, a survey has been made in the interests of California to observe what is being done in Arizona to prevent further dissemination of the weevil. Much detail is given concerning the topographical, meteorological, geological and botanic conditions of the region, all of which have their bearing upon the natural dispersion of the weevil and of its food-plant, the so-called wild cotton (*Thurberia thespesioides*). This plant blooms during the humid period of mid-summer rains, and with the ripening and bursting of the bolls the seeds are picked up and carried onwards with the floods caused by heavy rain. The floods eventually join one of the seasonal streams that flow into such main arteries as the Santa Cruz River and the tributary of the Rillito Creek that flows down the Sabino Canyon into the heart of the Santa Catalina Mountains. There are numerous subsidiary canyons on both sides, in many of which *T. thespesioides* grows, sometimes in the land covered by the wash of the swollen streams. The relative location of the cotton fields of the district to the habitat of this plant is shown in a map. Much of the territory, although good land, had not been planted with cotton before the stimulus to planting consequent upon the abnormal season of 1920 and the high price of cotton early in the season, and some of these new cotton areas are within about three miles of the permanent habitat of *T. thespesioides*. In 1919 a survey was made of the prevalence of

the plant, and later a campaign was undertaken for the destruction of the scattered plants and seedlings growing beside the lands washed by the floods. In 1920 an inspection service was initiated, which resulted in the discovery of five areas of cultivated cotton in the Rillito district that were infested with *A. grandis* var. *thurberiae*. In order to suppress, if possible, this infestation, the crop was picked, but the seed cotton was left in the infested fields, which were put into quarantine. Immediately after picking the plants were cut down, the fields thoroughly raked, and the fallen bolls burnt. After all other cotton had been ginned, the quarantine cotton was ginned separately, the seed kept separate, crushed and returned to owners for stock food, the lint was baled and the premises placed in quarantine. The gin was then taken to pieces and cleaned throughout, including the receiving-house, screens and all apparatus. All such cleanings were burnt.

Certain areas in the Tucson district have been set aside as non-cotton zones. Future legislation in California with regard to cotton will depend entirely upon the success obtained in Arizona with the remedial measures now in force.

BAKER (A. C.). U.S. Bur. Ent. **An Undescribed Aphid injurious to Rice in the Philippine Islands.**—*Mthly. Bull. Cal. Dept. Agric., Sacramento*, x, no. 4, April 1921, pp. 159–160, 3 figs.

Droyopeia hirsuta, sp. n., is described from the Philippines, where it lives on the roots of rice and does considerable damage to the crop. No alate forms were obtained, but the apterous individuals are quite distinct from others in this genus. This new species is closely related to *D. bella*, Koch.

BRÈTHES (J.). **Description d'un** *Ceroplastes* **(Hem. Coccidae) de la République Argentine, et de son Parasite (Hym. Chalcididae).**—*Bull. Soc. Ent. France, Paris*, 1921, no. 6, 23rd March 1921, pp. 79–81.

Ceroplastes argentinus, sp. n., is described from grasses. A Chalcid parasite, *Prorhopoideus baezi*, gen. et sp. n., was reared from it.

FEYTAUD (J.). **Les Vers de la Grappe: Cochylis et Eudémis.** [The Grape-vine Caterpillars: *Clysia ambiguella* and *Polychrosis botrana*.]—*Jl. d'Agric. Prat., Paris*, xxxv, no. 18, 7th May 1921, pp. 354–356.

An account is given of the usual remedial measures practised against these important vine pests, the information given being contained in papers previously noticed in this *Review*.

Contro le Tignuole dell'Uva. [Against Vine Moths.]—*Riv. Agric., Parma*, xxvi, no. 17, 29th April 1921, pp. 241–242.

The best treatment against vine moths [*Clysia ambiguella* and *Polychrosis botrana*] consists in a spray of lead arsenate before flowering, and one or two of nicotine after flowering for the second generation; these latter may be combined with lime-sulphur. Other measures, such as dusting with lime, collection of the moths, cleaning the stocks in winter, and shelter-traps, are also worth consideration.

La Formica argentina. [The Argentine Ant.]—*R. Lab. Ent. Agrar., R. Scuola Sup. Agric., Portici,* Circ. 1 [1920], 6 pp., 1 fig. [Received 11th May 1921.]

This circular has been issued in view of the threatened introduction from France into Italy of *Iridomyrmex humilis,* Mayr (Argentine ant). Brief notes on this pest, its distribution and habits, are given. Attention is drawn to the need for a careful examination of food-stuffs, fruits and plants in railway trucks and in ships. Remedial measures include poison-baits, for which the formula now adopted in the United States is given.

Silvestri (F.). **Il Crisomfalo o Cocciniglia rossa degli Agrumi** [*Chrysomphalus dictyospermi,* or the Red Scale of *Citrus.*]—*R. Lab. Ent. Agrar., R. Scuola Sup. Agric., Portici,* Circ. 2, 10th March 1921, 11 pp., 14 figs. [Received 11th May 1921.]

Citrus plants in south Italy and Sicily are infested by the following scales :—*Lepidosaphes pinnaeformis, Parlatoria zizyphi, Aspidiotus hederae, Saissetia oleae, Pseudococcus citri, Icerya purchasi, Coccus hesperidum, Ceroplastes sinensis, Aonidiella citri,* and *Chrysomphalus dictyospermi.* The last-named has greatly increased in recent years in the provinces of Naples and Caserta, and for this reason special attention is drawn to it. The natural enemies of this scale in Italy are *Aphelinus, Chilocorus, Exochomus* and *Rhizobius.* In Sicily and Italy infestation is often very greatly reduced by a mortality due to an unknown cause. As natural checks are unreliable, artificial measures must be employed; until hydrocyanic acid gas is available for fumigation, calcium polysulphide is the insecticide recommended. The materials required are fresh, well-burnt quicklime containing not more than 10 per cent. of impurities; very finely-powdered sulphur of 99–100 per cent. purity; and containers of tin, iron or earthenware, or wooden tubs if the quantity of solution is large. The formula is as follows: Stone quicklime,1 lb.; sulphur passed through a sieve, 2 lb; water, 1·3 gals. About one-third of the water is slightly warmed, the lime is then added, and when slaking begins the sulphur also. After mixing, the remainder of the water is poured in, mixing is continued and the solution is then boiled for forty-five minutes to an hour. From 4 to 8 parts of this stock solution is added to 100 parts of water to form the actual spray solution; it is not feasible to use a constant amount of 5 parts, because the density of the stock solution varies and allowance has to be made in accordance with the reading obtained from a polysulphide meter, such as Martelli's.

Greater adhesiveness is obtained by adding 4 per cent. of flour paste to the final spray solution; the paste is made with 1 part by weight of flour and 8 parts water, and it must be boiled, water being added to make up loss through evaporation. The sprayers should not have copper parts. The spray must be thoroughly applied when most of the larvae have hatched, provided the trees are not in full blossom. A second application must be made 15 or 20 days later.

Grandi (G.). **Di alcuni Afidi comunemente dannosi all'Agricoltura.** [Some Aphids ordinarily injurious to Agriculture.]—*R. Lab. Ent. Agrar., R. Scuola Sup. Agric., Portici,* Circ. 3, 15th March 1921, 22 pp., 10 figs. [Received 11th May 1921.]

A short, general description is given of the various forms of Aphids, with notes on their morphology, biology and natural enemies. The latter include fungi, especially Entomophthoraceae, predatory Diptera,

Neuroptera and Coleoptera (Coccinellids), and parasitic Hymenoptera (Cynipids, Chalcids, Proctotrupids and Braconids). The sprays mentioned are tobacco-soap emulsion, petroleum emulsion, an infusion of tobacco dust, and an infusion of quassia (*Picrasma excelsa*). The last-named is specially suitable for Aphids on peach, because there is no danger of injuring the delicate leaves.

The more common injurious species are:—*Brevicoryne* (*Aphis*) *brassicae*, L., *A. rumicis*, L., *A. persicae*, Boy., *Hyalopterus pruni*, F., *Toxoptera aurantiae*, Koch, *T. graminum*, Rond., *Macrosiphum rosae*, L., *Myzus cerasi*, F., *Eriosoma lanigerum*, Hausm., and *E. lanuginosum*, Htg. Except in the case of the last-named, the various forms, the biology, injury and remedies, are briefly dealt with.

MORGANTE (R.). **Per combattere l'Afide della Fava.** [Measures against the Bean Aphis.]—*L' Agric. Agrigentino, Girgenti*, xiii, no. 1–4, January–April 1921, pp. 24–26.

Owing to the wet weather in April the bean aphis [*Aphis rumicis*] has rapidly increased in the Province of Girgenti, Sicily, and spraying with a 2 per cent. solution of tobacco extract containing 5 per cent. nicotine is advised. Pruning off and burying the tender shoots is another measure against this Aphid. A petroleum-soap spray is liable to injure the flowers and foliage.

BONDAR (G.). **Os Insectos damninhos. xii. Uma Praga do Camboatá, o Bezouro,** *Colobogaster chlorosticta*, **Klug. xiii. O Gorgulho bicudo do Bambú,** *Rhinastus latisternus*, **Guer. Men.** [Injurious Insects. xii. *C. chlorosticta*, a Beetle Pest of *Guarea trichiloides*. xiii. *R. latisternus*, the Bamboo Weevil.]—*Chacaras e Quintaes, S. Paulo*, xxiii, no. 4, 15th April 1921, pp. 289–292, 6 figs.

A Brazilian forest tree, *Guarea trichiloides*, which is planted on a considerable scale as a shade-tree, has proved quite unsuitable for the purpose, owing its susceptibility to infestation by a Buprestid beetle, *Colobogaster chlorosticta*, Klug, which mines the trunk and also the branches as soon as their bark becomes rough.

This pest has a two-year life-cycle. The adults emerge in mid-October, and after swarming in hot sunshine at the end of October and during November, they oviposit in the bark, the eggs being laid in groups of from 5 to 20, or even more, according to the size of the trunks. The larvae mine the cambium without showing any external trace of their presence. During the cold weather in June and July they rest, and then recommence mining in the spring, August-September. In December or January they enter a rest period, and subsequently pupate in August.

C. chlorosticta is difficult to deal with because the damage it does only becomes apparent when well advanced. In the case of shade-trees that it is wished to save, an attempt may be made by removing the dry bark and killing the pests with a stiff wire, or birds may be relied on to destroy the exposed larvae and pupae.

Dr. Costa Lima has already dealt with some Curculionid pests of bamboo in Brazil [*R.A.E.*, A, iii, 306, 696]. An additional species, *Rhinastus latisternus*, Guér., has been observed in the State of S. Paulo. In February the adults infest the new stems, which are pierced for oviposition. The full-grown larva is said to possess an exquisite flavour and is much relished by the Indians. In September and

October it mounts to the upper part of the joint and pupates in a cocoon, transforming into the adult in December. The latter emerges in January or February. *R. latisternus* is comparatively rare, but when it occurs the injury is severe and renders the infested bamboos quite useless. To check it all infested canes should be cut off in April and May and exposed to the sunshine in order to kill the larvae. The giant bamboo is not attacked.

L.P.T. **Os Insectos Damninhos. xiv. Defesa contro o** *Gryllotalpa.* [Measures against the Mole-cricket.]—*Chacaras e Quintaes, S. Paulo,* xxiii, no. 4, 15th April 1921, p. 292, 1 fig.

A peculiar but effective method of protecting tender young plants against *Gryllotalpa tetradactyla,* Per., consists in wrapping their stems with leathery leaves, such as those of *Mammea americana.* A leaf is split along its midrib, and each half is wrapped round the stem, half the cylinder thus formed being below the level of the soil.

Bogdanov-Katkov (N. N.). **Очерк Возникновения, Организации и Деятельности Подотдела Борьбы с Вредителями за первые 9 месяцев его Существования. Предположенид на 1919 год.** [Outline of the Origin, Organisation and Function of the Sub-Section for the Control of Plant Pests during the first Nine Months of its Existence. Plans for 1919.]—**Известия Подотдела Борьбы с Вредителями при Петроградском Комитете по Сельскому Хозяйству** [*Bull. Sub-Section Control Plant Pests attached to the Petrograd Committee of Rural Economy*], *Petrograd,* i, April 1919, pp. vii–lv, 14 figs. [Received 13th May 1921.]

The sub-section for the control of plant pests was inaugurated at the beginning of 1918, and its work for that year, as well as the intended programme for 1919, is reviewed. The functions of the department include the systematic organisation of campaigns and investigations into the life-history of various insect pests occurring in the neighbourhood of Petrograd.

During 1918 *Euxoa* (*Agrotis*) *segetum* was particularly injurious to freshly planted cabbages and other vegetables.

Reichardt (A. N.). **Капустная Моль** (*Plutella maculipennis,* **Curt.**).—**Известия Подотдела Борьбы с Вредителями при Петроградском Комитете по Сельскому Хозяйству** [*Bull. Sub-Section Control Plant Pests attached to the Petrograd Committee of Rural Economy*], *Petrograd,* i, April 1919, pp. 6–77, 15 figs. [Received 13th May, 1921.]

The literature of the Tineid moth, *Plutella maculipennis,* Curt. (*cruciferarum,* Z.) is reviewed. During 1918 investigations into the life-history of this pest in the vicinity of Petrograd were undertaken, the results of which are here described. The food-plants include many wild and cultivated cruciferous plants, but beetroot is apparently generally preferred for oviposition, though the injury to this crop is less than to cabbages owing to its greater resistance. Besides crucifers it has also been found attacking *Salsola kali* (Chenopodiaceae) and *Cicer arietinus* (Papilionaceae). The eggs are laid singly or in groups of from 2 to 5 on the lower surface of the leaves,

the total number laid by each female varying from 70 to 90. They hatch in about six days, and the emerging larvae eat through the cuticle into the parenchyma of the leaf. The larval stage averages 16½ days, during which time three moults occur. As a rule the larvae remain in the mine in the leaf until the first moult, after which they feed externally, but occasionally the second stage larva may make a fresh mine. If the leaves of the food-plant are very thin, the larvae feed externally from the beginning. The cocoon is formed on the leaf, and pupation lasts on the average 11½ days, giving a total life-cycle from egg to adult of about 34 days. This time varies, however, according to weather conditions and latitude. Farther south, in the vicinity of Voronezh, the total cycle is from 18 to 19 days; the egg-stage three, larva ten, and pupa five to six days.

The number of generations in the year in the Petrograd district has not been definitely ascertained; there are probably three, though occasionally only two may occur, or sometimes a partial fourth. From the middle of July to about the middle of September all stages of the moth may be found simultaneously on cabbages. Hibernation occurs in the pupal stage.

Natural enemies include various birds, the predaceous larvae of *Coccinella septempunctata*, L., and *C.* (*Propylaea*) *quatuordecimpunctata*, L. A list of all the known Hymenopterous parasites is given. Of these, the Ichneumonid, *Angitia fenestralis*, Holmgr., and a Braconid have been reared from the larvae near Petrograd, and *Sagaritis latrator* Grav., *Tamelucha plutellae*, Ashm., and *Phaeogenes plutellae*, Kurdj., have been recorded from other parts of Russia.

The remedial measures suggested by various authors are discussed, but their efficacy when applied under existing conditions in North Russia has not yet been proved. Spraying with stomach poisons is not advocated owing to adverse climatic conditions; but the need for the application of measures such as clean cultivation, the planting of trap-crops, and general care of the plants, thus increasing their resistance, is emphasised.

Cholodkovsky (N. A.). **О половом Аппарате Хренового Листоеда** (*Phaedon cochleariae*, **Fabr.**). [On the Genital Apparatus of *Phaedon cochleariae*, F.]—**Известия Подотдела Борьбы с Вредителями при Петроградском Комитете по Сельскому Хозяйству** [*Bull. Sub-Section Control Plant Pests attached to the Petrograd Committee of Rural Economy*], *Petrograd*, i, April 1919, pp. 100–102, 2 figs. [Received 13th May 1921.]

The genitalia of both sexes of *Phaedon cochlearie*, F., are described.

Cholodkovsky (N. A.). **Заметка о Тополевой Тле** (*Schizoneura passerinii*, **Signoret**). [Note on the Poplar Aphid, *Schizoneura passerinii*, Sign.]—**Известия Подотдела Борьбы с Вредителями при Петроградском Комитете по Сельскому Хозяйству** [*Bull. Sub-Section Control Plant Pests attached to the Petrograd Committee of Rural Economy*], *Petrograd*, ii, no. 2, 1919, pp. 3–6, 3 figs. [Received 13th May 1921.]

Schizoneura passerinii, Sign., is recorded on poplar (*Populus balsamea*) in the vicinity of Petrograd. At the beginning of July 1919 only apterous forms were noticed, the nymphs appeared towards

the middle of the month, and by the 22nd of July the alate forms were seen. These were both male and female. This is apparently the first record so far of an oviparous winged Aphid. Although mating was not actually observed, there is no doubt, owing to the anatomical structure of the insects, that the winged female is fertilised by the winged male.

SILANTIEV (A. A.). **Организація Энтомологическаго Отдѣла Николаевской Опытной Станціи и Планъ его Работъ.** [Organisation of the Entomological Department of the Nikolaevsk Experiment Station and Plan of its Work.]—**Записки Энтомологическаго Отдѣла Николаевской Опытной Станціи** [*Bull. Ent. Dept. Nikolaevsk Expt. Sta.*], *Petrograd*, pt. 1, 1918, pp. 35–42. [Received 13th May 1921.]

The history of the inauguration of a special entomological department attached to the Nikolaevsk experiment station is briefly reviewed. In 1916 L. I. Bogdanova-Katkova was appointed to undertake systematic observations on the HALTICINAE and Dipterous enemies of graminaceous crops in the neighbourhood of the station.

BOGDANOVA-KATKOVA (L. I.). **Краткій предварительный Отчетъ о Работахъ Энтомологическаго Отдѣла въ 1916 году.** [Brief preliminary Report of the Work of the Entomological Department in 1916.]—**Записки Энтомологическаго Отдѣла Николаевской Опытной Станціи** [*Bull. Ent. Dept. Nikolaevsk Expt. Sta.*], *Petrograd*, pt. 1, 1918, pp. 43–61, 3 figs. [Received 13th May 1921.]

During 1916 insect pests were comparatively scarce. The most serious cabbage pest was *Phorbia* (*Chortophila*) *brassicae*, Bch., adults of which were seen in abundance on 10th May. The eggs were found on 17th May on the stem immediately above the ground and more frequently in the ground in the vicinity of the roots. The chief methods of eradicating this fly are the scraping of eggs from the stems and the application of saltpetre or ammonium sulphate to the surrounding soil. The plant is thus strengthened and becomes more resistant to attack. Other vegetable pests dealt with during the year are *Eurydema oleraceum*, L., and *E. dominulus*, Scop., the larvae of which were numerous in June and July on weeds; and *Brevicoryne* (*Aphis*) *brassicae*, L., on cabbage, beetroot, *Raphanus raphanistrum* and *Capsella bursa-pastoris*. *Syrphus ribesii*, L., *S. balteatus*, DeG., and other Syrphids were generally found in kitchen gardens where *Brevicoryne brassicae* was numerous. *Pieris brassicae*, L., *P. rapae*, L., and *P. napi*, L., were not very abundant, probably owing to the activity of parasites. *Barathra* (*Mamestra*) *brassicae*, L., *Polia* (*M.*) *pisi*, L., and *Plutella maculipennis*, Curt., occurred on cabbages. *Meligethes aeneus*, F., is chiefly a pest of cruciferous plants grown for seed, but was also found on Ranunculaceae. It was associated with *Malachius aeneus*, L. *Athous niger*, L., *Agriotes lineatus*, L., and *A. obscurus*, L., were particularly abundant

on reclaimed grassland. Experiments with poison baits for these wireworms gave doubtful results.

Phaedon cochleariae, F., and *P. armoraciae*, L., appeared in the middle of April but were only abundant with the advent of warm weather. Under laboratory conditions eggs were laid on 16th June on the leaves of wild radish. Eggs have also been found on turnips and cabbages; they hatch in about seven days. Other flea-beetles included :—*Phyllotreta undulata*, Kutsch., *P. nemorum*, L., *P. consobrina*, Curt., *P. sinuata*, Steph., and *P. nigripes*, F., on cabbages, turnips, mustard and various weeds. All these species were found in the latter half of April in the field on *Capsella* and *Raphanus* and on young turnip leaves that had survived the winter, while in the gardens only *P. nigripes*, F., occurred on *Capsella* and on cabbage in the forcing beds. Towards the end of the month the other species also appeared in gardens, and all species attacked turnips and beetroots planted out for seed in May.

The larvae of the summer generation of *P. undulata* were found mining the leaves of wild radishes and turnips at the beginning of July. They entered the soil to pupate about 28th July, this stage lasting from 18 to 27 days. The last adults emerged 7th September.

Ceuthorrhynchus sp. was abundant in the larval stage on cabbages, crawling down the stem and eating out the heart.

The pests of grain crops are *Haplothrips* (*Anthothrips*) *aculeatus*, F., *Frankliniella* (*A.*) *tritici*, Kurdj., *Limothrips denticornis*, Hal., *Aelia acuminata*, L., *Ochsenheimeria taurella*, Schiff. (grain moth), *Lema melanopa*, L., *L. cyanella*, L., *Oscinella* (*Oscinis*) *frit*, L., and *O. pusilla*, Meig. The last two appeared at the end of May, and larval injury to oats and barley was noticed at the beginning of June. Cocoons were found in the stems at the end of June, the inactive stage lasting seven or eight days. The second or summer generation of *O. frit* is thus established in the ears of oats ; the adults begin emerging at the end of July, and larvae were found on 17th August. The eggs of *Chlorops taeniopus*, Meig., were observed on the leaves of barley. The larvae appeared during June and the first half of July, and the adults emerged between 30th July and 15th August.

Pests of forage crops are *Sitona* sp., on clover, the eggs of which were laid about the end of April ; *Apion* sp. ; and *Cleigastra flavipes*, Fall., on timothy and rye.

Other pests recorded are *Psylla mali*, Först., the eggs of which were noticed on the branches of apple about 20th August, and *Aphis pomi*, DeG. Although Coccinellids were numerous among the colonies of the latter, they were not of much value as they were themselves parasitised by *Perilitus terminatus*, Nees. *Cheimatobia brumata*, L., occurred in abundance on apples and cherries. Pupae of *Cydia* (*Carpocapsa*) *pomonella*, L., were noticed in cracks of the bark up to 22nd April. About 22nd July the larvae began entering the trap bands for hibernation. The first adults of *Hyponomeuta malinellus*, Z., appeared in the laboratory on the 26th June and in the field on the 1st July. This moth is heavily parasitised by an undetermined Hymenopteron. *Byturus tomentosus*, F., was occasionally found on raspberry and other plants. Injury by *Anthonomus pomorum*, L., was already clearly noticeable between 15th to 20th May ; the adults emerged at the beginning of June.

Bogdanov-Katkov (N. N.). **Краткия Сведения о главнейших Вредителях Сельско-Хосяйственных Растений.** [Brief Summaries of the chief Pests of Agricultural Plants.]—**Отд. оттиск из «Справочной Книжки Русского Агронома»** [Separate from *Handbook of the Russian Agronomist*], *Petersburg*, 1920, 25 pp. [Received 13th May 1921.]

The pests dealt with in this paper are tabulated according to the crops attacked, brief notes being given with reference to the most injurious stages, important biological characteristics, distribution and remedial measures. A table for the preparation of insecticides is also appended.

Davidov (A.). **Яблонная Моль.** [Apple Moth.]—**Государственное Издательство** [*Government Publication*], *Petersburg*, 1920, 4 pp., 1 fig. [Received 13th May 1921.]

The maximum flight of *Hyponomeuta malinellus*, Z., occurs in July. Oviposition takes place during this time on the two- to three-year-old shoots of apple trees. The eggs, which are laid in batches of from 15 to 60 and hatch in about three to four weeks, are covered with a secretion that forms a hardened shell when exposed to the air. The emerging larvae hibernate under this until the first buds appear in the following spring. They feed on the leaves, and form a web-like covering for protection against enemies and weather. In June large numbers of larvae collect in one nest, sometimes as many as 1,000, and begin to form cocoons. Pupation lasts from two to three weeks. The remedial measures advocated are collection of leaves containing feeding larvae, spraying with Paris green immediately after the blossoms appear, and the collection and destruction of nests.

Davidov (A.). **Яблонный Цветоед.** [*Anthonomus pomorum*, **L.**] —**Государственное Издательство** [*Government Publication*], *Petersburg*, 1920, 4 pp., 1 fig. [Received 13th May 1921.]

Anthonomus pomorum, L., is one of the chief orchard pests in the Petersburg district. A brief account is given of its life-history. The remedial measures advocated include thorough cleansing of the bark, the application of sticky bands, spraying with 3 lb. of freshly slaked lime to 3 gals. of water and hand collection of buds containing larvae and pupae.

Bogdanov-Katkov (N. N.). **Приготовление и Применение Главнейших Составов, употребляемых для уничтожения вредных Огородных Насекомых.** [Preparation and Application of the chief Compounds used for the Destruction of noxious Insects of the Kitchen Garden.]—**Государственное Издательство** [*Government Publication*], *Petersburg*, 1920, 13 pp., 6 figs. [Received 13th May 1921.]

This bulletin contains general rules for the times and methods of spraying as well as instructions for the preparation of the chief insecticides.

Bogdanov-Katkov (N. N.). **Бабануха,** *Phaedon cochleariae,* **F.—Государственное Издательство** [*Government Publication*], *Petersburg,* 1921, 20 pp., 19 figs. [Received 13th May 1921.]

Great damage is caused annually to cruciferous crops in the Petersburg district by *Phaedon cochleariae,* F. The various stages are described. Hibernation occurs in the adult stage in the ground. *P. armoraciae,* L., is another flea-beetle often found associated with it, but is of no great economic importance to crucifers in this district. Towards the end of June and beginning of July the adults of *P. cochleariae* are very numerous, and oviposition takes place. As many as 400 or more eggs may be laid by a single female, and they are inserted into the leaves. Eggs of the second generation are laid in August. They hatch in from 8 to 12 days, the first moult occurring in from 3 to 6 days and the second on the 12th day. On about the 17th day the larvae enter the ground, and on the 23rd day, prior to pupation, they moult for the third and last time.

Pupation lasts from 8 to 10 days. The average length of life from egg to adult is from 33 to 37 days. The only parasites recorded are a Tachinid fly, *Meigenia* sp., and a fungus.

Remedial measures include cultural methods, collection of adults by shaking them off the plants into a receiver, and spraying with Paris green or lead arsenate. Barium chloride has not given good results owing to the great humidity during the summer months. The method of preparing and applying the sprays is described, and spray machinery is illustrated.

Dallas (W. K.). **Control of Red Mite on Fruit Trees : Further Tests at Papanui Experimental Orchard.**—*N. Z. Jl. Agric., Wellington,* xxii, no. 3, 21st March 1921, pp 171–174.

Further experiments at Christchurch against red-mite [*Tetranychus* sp.] on apple and plum trees confirm the results obtained in the previous season [*R. A. E.,* A, viii, 324], namely, that lime-sulphur is effective against the adults, especially where trees have received an oil spray in the dormant period, but not against the eggs.

Caustic soda (1–10), as a dormant spray, destroyed mussel scale [*Lepidosophes ulmi*], but was also ineffective against the eggs of the red mite.

Bilsing (S. W.). **The Pecan Nut Case-bearer** (*Acrobasis caryaevorella*). —*Jl. Econ. Ent., Concord, N.H.,* xiv, no. 2, April 1921, pp. 149–153.

Acrobasis caryaevorella (pecan nut case-bearer) is the most important enemy of the pecan nut industry in Texas, and caused almost a complete failure of the crop in 1920. There are three generations of this moth in the year. The greatest injury is caused by the larvae of the first generation, although occasionally damage by the second may be serious. Hibernation occurs in the larval stage in the burrow at the base of the buds. The larvae become active about the time the buds start in the spring, and the adults emerge over a period of about 20 days, beginning at the latter part of April. Eggs are laid about three to nine days later in the centre of the pistil of the nut and hatch in about five days. For the first few days the larvae attack the buds below the nut cluster, after which they bore into the nuts at the base.

As the nuts are very small at this time, one larva may attack several of them. The hollowed-out nuts drop to the ground. The larval stage lasts from 25 to 29 days, after which pupation occurs inside the nut.

Spraying experiments show that a pressure of at least 250 lb. is required to ensure good results, and that one of 350 lb. is still more efficacious. A spray gun is advocated in preference to a nozzle. The first spray, applied on 8th May, consisted of 3 lb. lead arsenate to 50 U.S. gals. water, and was followed by a second application on 22nd May. A third spray was applied 26th June, but this is not essential unless the larvae of the second generation are very abundant. In a different locality, spraying with calcium arsenate gave negative results, but the reason for this failure can only be determined by further experiment.

Herrick (G. W.). **The Codling Moth—A Quandary and a Query.**—*Jl. Econ. Ent., Concord, N.H.*, xiv, no. 2, April 1921, pp. 156–160.

The problem of controlling the codling moth [*Cydia pomonella*] is discussed, and the opinions of various authors with reference to the proportion of entry through the calyx and of side injury are quoted. The necessity for further investigations along these lines is emphasised. In the discussion following this paper R. W. Brancher pointed out the necessity for varying the spraying campaign to correspond with the life-history of the moth in each individual year.

Sanders (J. G.). **The Trend of Horticultural Inspection.**—*Jl. Econ. Ent., Concord, N.H.*, xiv, no. 2, April 1921, pp. 161–166.

The advantages and uses of horticultural inspection are discussed, and it is suggested that efforts should be made to secure adequate appropriations to improve the horticultural service.

Marlatt (C. L.). **Recent Work of the Federal Horticultural Board.**—*Jl. Econ. Ent., Concord, N.H.*, xiv, no. 2, April 1921, pp. 166–171.

As a result of the increased appropriation in 1920, several new post inspection offices have been opened and the service of the older offices have been amplified. The general work of the board with regard to the establishment of quarantine during the year is reviewed.

Headlee (T. J.). **The Present Status of the Gipsy Moth in New Jersey.**—*Jl. Econ. Ent., Concord, N.H.*, xiv, no. 2, April 1921, pp. 172–178.

In July 1920 an outbreak of the gipsy moth [*Porthetria dispar*] was found in New Jersey. The predaceous Carabid, *Calosoma sycophanta*, was also found to be present. Immediate action was taken to ascertain the extent of the infestation. It proved to be scattered over about 90 sq. miles, and the centre lay in a 30-acre block of blue spruce. The pest had been probably imported with the stock of this tree about 12 years previously from Belgium and Holland. Its extermination in New Jersey is thought possible, and it has been decided to ask for an appropriation of about £60,000 for the year ending 30th June 1921, and £120,000 for the following year. As a protection for other districts the entire area of about 200 sq. miles has been included in a quarantine.

Deputy (O. D.). **Activities of the Federal Horticultural Board on the Texas-Mexican Border.**—*Jl. Econ. Ent., Concord, N.H.*, xiv, no. 2, April 1921, pp. 178–183.

The work of the inspection force on the Texas-Mexican border is described. From 80 to 90 tons of potassium cyanide and 10 or 12 cars of sulphuric acid are used annually in fumigating cars infested with cotton seed. The work also includes the inspection of passengers to prevent the entry into Texas of quarantined products.

O'Byrne (F. M.). **Standardized Nursery Inspection.**—*Jl. Econ. Ent., Concord, N.H.*, xiv, no. 2, April 1921, pp. 183–188.

Suggestions are made for the standardisation of nursery inspection requirements, so that unimportant variations and needless confusion may be eliminated. Such an inspection service, to afford proper protection, must provide, for instant use, a complete record of all nursery stock moved with its sanction and permission.

Dietz (H. F.). **Some Problems in Greenhouse Inspection Work in Indiana.**—*Jl. Econ. Ent., Concord, N.H.*, xiv, no. 2, April 1921, pp. 188–194.

If a grower is refused a certificate of inspection, he can ship greenhouse plants by attaching a statement to them showing that they are greenhouse-grown and, as such, do not come under the regular nursery inspection requirements. The facility thus offered for the spread of noxious insects and the resulting problems are discussed. A list of insects and plant diseases is given, arranged according to their prevalence in Indiana greenhouses.

These include such important pests as the tropical ants, *Prenolepis longicornis* and *Iridomyrmex humilis*, which have not been recorded in nature in Indiana.

Montgomery (J. H.). **Plant Quarantine Work at Florida Points.**—*Jl. Econ. Ent., Concord, N.H.*, xiv, no. 2, April 1921, pp. 195–200.

A general description is given of quarantine work as carried out by the State Plant Board of Florida, with a summary of the factors that contribute to successful work.

Beattie (R. K.). **The Operation of Quarantine No. 37.**—*Jl. Econ. Ent., Concord, N.H.*, xiv, no. 2, April 1921, pp. 201–205.

The application and operation of the various regulations of Quarantine no. 37 [*R.A.E.*, A, vii, 184] up to 10th December 1920 are reviewed.

Parrott (P. J.). **Control of Sucking Insects with Dust Mixtures.**—*Jl. Econ. Ent., Concord, N.H.*, xiv, no. 2, April 1921, pp. 206–214.

Experiments with dusting mixtures on a number of common sucking insects showed that air currents, denseness of tree growth, low temperatures and exudates of insects, such as wax and honeydew, exert a greater adverse influence on dusting than on spraying materials. With such pests as red-bugs and Aphids a thorough coating of the insect is required to obtain satisfactory results.

A dust containing 0·5 per cent. nicotine produced almost instant paralysis of *Lygidea mendax*, Reut. (apple red-bug) and was as quick

in action as a preparation containing 1·0 per cent. The apple and grape leafhoppers, *Empoasca unicolor,* Gill., and *Empoa rosae,* L., also proved very susceptible to the same dust. An application of dehydrated copper sulphate and lime containing 2·0 per cent. nicotine destroyed 80 per cent. of the leafhoppers on grapes.

The susceptibility of Aphids varies in different species, thus *Macrosiphum solanifolii* and *Eriosoma lanigerum* were more resistant than *Aphis pomi,* De G., *A. sorbi,* Kalt., and *Siphonaphis padi,* L. (*A avenae,* F.). Apple Aphids were reduced by 78·6 per cent. by a heavy application of air-slaked lime. Although many nymphs of *Psylla pyricola,* Forst., were killed by the dust, it is less effective than spraying against this pest. Spraying is more effective against hibernating adults than dusting. Mixtures containing 0·5 per cent. and 2·0 per cent. nicotine proved effective against *Myzus ribis,* L. (currant aphis), and a 2·0 per cent. nicotine mixture paralysed the nymphs of the bug, *Poecilocapsus lineatus,* F. The need for further investigations and the improvement in machine construction is emphasised. In view of the probable large range of chemical agents that could be prepared in commercial quantities as soon as their properties are known, attention is also drawn to the necessity of co-operation between entomologists and chemists.

HEADLEE (T. J.). **Dusting as a Means of Controlling Injurious Insects.** —*Jl. Econ. Ent., Concord, N.H.,* xiv, no. 2, April 1921, pp. 214–220, 1 fig.

Since experiments carried out in 1917, sulpho-arsenical lime dusts have been advocated as practically equivalent in efficiency to self-boiled lime-sulphur and lead arsenate liquid sprays for the control of insects and diseases on peaches. The dust is less efficacious against pests of apples and cannot compare with the results obtained with liquid sprays. The difference between the results obtained in New Jersey and Nova Scotia with dusting experiments against the codling moth [*Cydia pomonella*] may be due to the relation between the effects of the dust and the distribution of rainfall. The comparatively poor results obtained with dusts against the plum curculio [*Conotrachelus nenuphar*] are perhaps due to the same cause.

QUAINTANCE (A. L.). U.S. Bur. Ent. **Dusting versus Spraying of Apples.**—*Jl. Econ. Ent., Concord, N.H.,* xiv, no. 2, April 1921, pp. 220–225, 6 tables.

The results obtained by the Bureaus of Entomology and of Plant Industry during the last few years in dusting apple orchards in comparison with spraying are tabulated. These show that dusting will control the codling moth [*Cydia pomonella*] and plum curculio [*Conotrachelus nenuphar*] on apples almost as well as spraying if the infestation is not very severe. During the last two seasons neither dusting nor spraying has proved very effective on peaches in Georgia.

GIDDINGS (N. J.). **Orchard Dusting versus Spraying.**—*Jl. Econ. Ent., Concord, N.H.,* xiv, no. 2, April 1921, pp. 225–238.

The comparative efficacy of dusting and spraying from the point of view of controlling apple scab and other fungus diseases is discussed.

ILLINGWORTH (J. F.). **Arsenic for Grub-infested Soils.**—*Jl. Econ. Ent., Concord, N.H.*, xiv, no. 2, April 1921, pp. 238–239.

An application of arsenic at the rate of 80 lb. per acre has proved an effective check on *Isodon puncticollis*, Macl., infesting cucumbers. The results of the observations are most encouraging, especially as the poison has no detrimental effect on growing plants even when used at the excessive rate of 200 lb. per acre. Tests have also shown that sugar-cane grown on treated land does not take up the poison. The effect of arsenic on soil bacteria is the only possible disadvantage of this treatment.

BARBER (G. W.). U.S. Bur. Ent. **Possible Use of a Trap to control Leafhoppers injurious to Fruit Trees.**—*Jl. Econ. Ent., Concord, N.H.*, xiv, no. 2, April 1921, p. 240.

During experiments with traps baited with grape-fruit and placed in an apple tree, thousands of adults of *Empoa rosae* were caught. The trap was about four feet from the ground and at least three feet below the nearest foliage. This method may prove of assistance in the control of this pest.

Quarantine Proclamation No. 82.—Extract from *Commonwealth of Australia Gazette*, no. 43, 12th May 1921.

By a proclamation dated 6th May 1921 under the Quarantine Act 1908–1920, the introduction into Australia is prohibited of the following insects: *Attagenus undulatus*, Motsch. (khapra beetle), *Pyrausta nubilalis*, Hb. (European corn borer), *Platyedra* (*Gelechia*) *gossypiella* (pink boll-worm) and all other Gelechiids, and *Anthonomus grandis* (Mexican boll weevil).

HILL (G.). **The White Ant Pest in Northern Australia.**—*Australia: Inst. Sci. & Ind., Melbourne*, Bull. 21, 1921, 26 pp., 15 plates.

This paper is in the nature of a preliminary note to a more comprehensive study which, it is hoped, will be published later. While termites in northern Australia are probably unrivalled by any other insect in economic importance, there are many species that are of minor importance, harmless, or even in some cases beneficial.

The most injurious species are *Mastotermes darwiniensis*, *Coptotermes acinaciformis*, *Rhinotermes reticulatus*, *R. intermedius*, and one or two undetermined species of *Eutermes*. The first-named is the largest and most destructive termite. It frequently constructs a nest in a fence-post or dead tree, the wood lying beneath or just above the surface of the ground being entirely replaced by tier upon tier of horizontal cells.

Practically all indigenous trees producing timber of any economic value are subject to attack by termites, and many root-crops, sugar-cane, melons, fruit trees, cassava, pawpaw, granadilla, *Poinciana*, sisal, potatoes, coconuts, pineapples, etc., are also destroyed by them. The predominant forest trees are species of *Eucalyptus*, which produce the bulk of the timber used in the country, and nearly all of them are subject to attack, the heartwood especially being destroyed by *Coptotermes* and occasionally by *Rhinotermes*. The attack begins

below the surface of the soil, and continues, as a narrow tunnel, up the heartwood of the trunk and main branches. Later, a termitarium or nest is frequently constructed at the base of the tree.

The methods of control and prevention of attack are reviewed. For growing trees, soil fumigation with carbon bisulphide has proved prohibitive in cost and temporary in effect. Lead arsenate in water (1 lb. paste to 16 gals.) gave excellent results when poured into a shallow trench round the trunks of small trees in the early stages of attack; further trials are, however, necessary to determine the effect of repeated treatments on plant life, the minimum strength and number of applications required for effective results, the best time for carrying out the process and, incidentally, the effect upon other insects in the soil. Mercury bichloride is effective but was found to injure the plant; experiments with weaker solutions should be tried. Poisoned baits have been tested, but the results were not conclusive. A device known as the "white ant exterminator" has been used with success in fumigating certain trees, hollow posts, etc., with arsenic and sulphur. An equally effective and less expensive method is to inject the solution of lead arsenate mentioned above by means of a small syringe into the trunk of a tree, a small hole being bored into the centre of the trunk. After the injection the hole should be closed with a hardwood plug cut off level with the bark, which will eventually overgrow it. Other arsenical mixtures, such as Paris green, would probably prove as effective; solutions of sodium arsenite and arsenical cattle dips proved more or less destructive to the plants.

The relative resistance of various indigenous and imported timbers to termite attack is discussed. As the sapwood is the part most usually infested, it should be removed from the lower parts of posts or piles to at least a few inches above ground level. Serious damage to rafters, joists, flooring boards, fence posts, rails, etc., is almost certain to result unless steps are taken to protect them from attack. Various chemicals, oils and products of coal are recommended, but the expense of treatment is so great that it is seldom practised. House blocks and piles, however, are usually treated in some way. Zinc chloride and corrosive sublimate are thoroughly effective, but are too costly for general use. The former, in a 6 per cent. solution, is especially suitable for the treatment of wood that is to be painted, the latter for dealing with localised attacks. A strong solution of alum in water is also effective, but its use is restricted owing to its solubility and cost. Sodium arsenite is probably the cheapest and most effective poison, and forms the basis of many anti-termite specifics. Wood-preserving oils, creo-tar oil and coal tar appear to protect timber, but repeated applications are necessary if the timber is exposed to the weather, or is liable to split. An efficient mixture for protecting stockyard rails morticed or bolted to termite-infested posts is made by boiling $1\frac{1}{2}$ lb. white arsenic and 2 lb. commercial washing soda in one gallon of water, and stirring into it, while nearly boiling, $1\frac{1}{2}$ gals. of hot coal tar. Fences require constant attention and free use of poison to protect them from serious injury and ultimate destruction. A small quantity of arsenic, dry or in solution (5–10 per cent.), poured into the top of hollow posts will prevent their destruction; the protection of solid or split posts is more difficult, but may be effected by pouring a quantity of arsenical solution into a shallow trench around the base of each. This, however, would be costly on large areas, and the risk to stock must be remembered.

Buildings in northern Australia are generally constructed of a wood framework resting upon hardwood blocks or piles, iron plates or stump-caps being interposed to prevent the passage of termites. Ten to fifteen years is probably the normal life of a block, but termites frequently manage to destroy them long before, while the corrosive action of a fluid secreted by the insects destroys the metal cap. Ferro-concrete piles, brickwork or masonry are all liable to attack by those species that construct covered-ways up the outer surface, such as *Mastotermes darwiniensis, Rhinotermes reticulatus, Microcerotermes nanus, M. serratus* and *M. turneri.* If a solid and continuous floor of concrete be used as a base, care must be taken to prevent the construction of covered ways, to use good concrete and to ensure that no studs or verandah posts pass through the concrete to the soil below.

While the total eradication of termites seems to be impracticable, much of the loss due to them might be prevented. Profitable investigations might be undertaken to determine the life-history and habits of the above-mentioned species, to find out what other species occur in Australia, to devise means of rendering timber resistant to attack for long periods, and to study the suitability of imported and indigenous timber for the purpose. Soil studies are necessary to determine the reason for the absence of destructive species in certain localities adjacent to infested areas. Experiments with arsenic, sodium cyanide and other chemicals should be tried with a view to rendering the soil poisonous or repellent to termites and to determine the effect upon plant growth. The most effective intestinal poison for termites should be ascertained, and the best method of distributing it in palatable form. The insecticidal value of chemical fertilisers in cultivated soil, and the possibility of their increasing resistance to termites and their effect on the plants require study.

DRAKE (C. J.). **A New Ambrosia Beetle from the Adirondacks ; Notes on the Work of** *Xyloterinus politus,* **Say.**—*Ohio Jl. Sci., Columbus,* xxi, no. 6, April 1921, pp. 201–205, 1 fig.

Xyleborus (*Anisandrus*) *swainei,* sp. n., here described, has been found in the western Adirondacks. It breeds in moist logs of beech and hard maple. It does damage similar to that by *X.* (*A.*) *obesus,* and is found both in the trunk and larger branches.

A common predatory insect on both bark and ambrosia beetles, especially in spruce, is an Anthocorid bug, *Anthocoris* (?) sp., which is commonly found in the burrows of *Polygraphus rufipennis, Dryocoetes piceae, D. americana, Orthotomicus caelatus,* and occasionally in tunnels of *Trypodendron bivittatum.* Some nymphs have been found in the burrows of *Ips pini, Pityogenes hopkinsi, Dryocoetes betulae, Trypodendron betulae, X.* (*A.*) *obesus* and *Xyloterinus politus.* Other predators found were the following. In the burrows of *X. obesus,* Lec. :—*Molamba lunata,* Lec., *Rhizophagus dimidiatus,* Mann., *Cerylon castaneum* Say, and *Colydium lineola,* Say. In the burrows of *X. swainei* :—*Euperea ovata,* Horn (?); and in the burrows of *Xyloterinus politus,* Say, and *Pterocylon mali,* Fitch :—*Anistoma* sp., *Siagonium punctatum,* Lec., *Rhizophagus bipunctatus,* Say, *Homalium* sp. (?), *Laemophloeus biguttatus,* Say, *Cerylon castaneum,* Say, and *Rhizophagus remotus,* Say. *Anthocoris borealis,* Dall., is occasionally found on coniferous trees, but is more common on willows or deciduous trees.

Xyloterinus politus, Say, prefers beech, but is also common in maple and frequently birch. The larval cradles are described, with the characteristics distinguishing them from those of *Gnathotrichus*, *Pterocylon* and *Trypodendron*.

The Black Citrus Fly and Jamaica Fruits in the United States.—*Agric. News, Barbados,* xx, no. 495, 16th April 1921, p. 122.

A meeting held in Washington, in December 1920, to discuss the advisibility of prohibiting the importation of fruits or vegetables into the United States from places where the citrus black fly, *Aleurocanthus woglumi*, Ashby, was known to occur, was attended by the Jamaica Government entomologist, who argued that prohibition was unwarranted in the case of the principal exports from Jamaica—bananas, coconuts and citrus fruits. Bananas are not a food-plant of *A. woglumi*, and the bunches are shipped without packing; coconuts are shipped husked; and while *Citrus* is a food-plant of this pest, the fruits are not attacked, and they are washed and packed separately prior to shipment. Furthermore, Jamaica citrus fruits are shipped to New York, which is far from any citrus-growing district.

The Quarantine Order (no. 49) subsequently issued on account of the citrus black fly, prohibited on and after 1st April 1921 the importation into the United States from Cuba, the Bahamas, Jamaica, Canal Zone, Costa Rica, India, Philippine Islands, Ceylon, and Java, of fruits, vegetables, etc., except as provided for in regulations supplemental to the order. According to the provision of these regulations "clean fruit and vegetables, other than those subject to special quarantines, may be imported from the countries and localities named in this quarantine, under permit, upon compliance with these regulations." This would appear to make adequate provision for the admission of fruits from Jamaica and other countries where citrus black fly occurs.

Ballou (H. A.). **Trapping Cotton Stainers.**—*Agric. News, Barbados,* xx, no. 495, 16th April 1921, pp. 122–123.

The methods usually employed for trapping cotton stainers [*Dysdercus* spp.] are described. Trapping ought to commence before the stainers have left the cotton fields for uncultivated land, and must be continued even up to the time when the fields begin to supply them with food. All cotton stainers left in the fields at the end of the season should be trapped, as far as possible. In order to destroy the largest possible number of stainers, therefore, the traps must be visited daily, and the material forming them renewed from time to time. Stainers appear to be attracted principally to suitable food in suitable situations, shade and moisture, or coolness appearing to be very important. The heaps of plants in the field at the end of the cotton crop will attract large numbers of them, and a small quantity of cotton seed, or cotton-seed meal on the ground under each heap would probably enhance its attractiveness, by providing a large amount of food, well protected and shaded. These heaps must be burned. For the other type of trap, consisting of heaps of cotton seed or cotton-seed meal, the kerosine or gasoline torch is best, because it destroys the stainers without greatly injuring the bait. In the absence of a proper torch a heap of trash burned on each trap will destroy many if not all the stainers congregated there.

Sanders (G. E.) & Kelsall (A.). **White Arsenic as an Insecticide.**—*Canad. Hortic., Peterboro., Ont.*, Fruit Ed., xliv, no. 4, April 1921, p. 55.

Arsenious oxide, the ordinary white arsenic of commerce and the base from which all arsenical insecticides are made, is the most concentrated form in which to buy arsenic, and its cost is only one-fifth to one-tenth that of other arsenicals per unit of arsenic. Its disadvantages are the difficulty with which it mixes with water, its poor physical condition, its low killing value (as reported by some investigators), and its caustic action on foliage.

The difficulty of mixing may be overcome in part by using a superfine powder, and it has also been found that a mechanical mixture of white arsenic and some other powder readily miscible in water rapidly goes into suspension. This result may be obtained by mixing dry white arsenic thoroughly with an equal weight of hydrated lime. This mixture is, however, even more caustic than the arsenic alone. On the other hand the copper of Bordeaux mixture has been found to reduce the caustic action to the point of safety. In very few cases, and then only to a very slight extent, would potato foliage be injured by a solution of 1 lb. white arsenic to 10 lb. or more copper sulphate in 100 gals. water. It was found that if the greater part of the white arsenic goes into solution with the copper, and the ratios of copper and arsenic present are within certain limits, a safe Bordeaux-white arsenic mixture can be produced. The following method is adapted to farm practice :—

Superfine white arsenic, guaranteed to pass a screen of 250 meshes to the inch, must be used, with either high calcium or dolomite lime. To make a copper sulphate stock solution, 10 gals. of water are placed in a container and a mixture of 1 lb. of white arsenic and 1 lb. of hydrated lime is sifted in. The liquid is well stirred and a bag containing 10 lb. of crystal copper sulphate suspended in it, stirring being done from time to time. This solution must be made at least 24 hours before it is required ; it will keep indefinitely. It must be stirred before dilution for spraying.

This formula, which must be strictly adhered to, saves from 60 to 90 per cent. of the insecticide cost, and owing to the presence of Bordeaux mixture it encourages the use of a fungicide in spraying potatoes.

The Tortrix Tea Pest. Lime as a Treatment. [Communiqué of the Ceylon Dept. Agric., Peradeniya.]—*Planters' Chron., Coimbatore* xvi, no. 17, 23rd April 1921, pp. 283–284.

Experiments with lime as a measure against tea tortrix [*Homona coffearia*] are being made. At present no definite deductions are possible, but several planters have succeeded in temporarily eradicating the moth by this treatment. The method of application consists in scattering broadcast good slaked lime on the infested bushes, including, when egg-masses are present, the lower sides of the leaves, as the insects feed on the lower surfaces for the first eight days after hatching. The lime should be applied in the early morning, when the bushes are wet with dew, mist, or rain, but not during rain. From 5 cwt. per acre upwards is required, and the applications may be repeated if necessary. Well-scattered lime will remain on the bushes when they are dry, even during moderate rains.

Should this method prove efficacious in all cases no more practical measure along the lines of estate routine could be devised ; but it still seems probable that the key to the problem is the establishment of effective "flight breaks."

NÈGRE (M.) & PICARD (F.). **Sur les Moeurs et la Présence en France de** *Laspeyresia conicolana*, **Heyl. (Lep. Tortricidae).**—*Bull. Soc. Ent. France, Paris,* 1921, no. 1, pp. 10–12, 1 fig.

Cydia (*Laspeyresia*) *conicolana*, Heyl., is recorded on Corsican pine (*Pinus laricio*) in the forest of the lower Hérault mountains in France. There is only one generation a year, and hibernation, as in the case of *C.* (*L.*) *strobilella*, L., probably occurs in the larval stage. Adults were noticed in April and May. As a result of attack by this moth the seeds are rendered useless, and the pine cone itself becomes deformed. Serious damage has also been caused to Corsican pine cones by the larva of a Cecidomyiid not yet identified.

MASSÉ (A.). **Insectes nuisibles des Forêts. iii. Le Charençon des Pins,** *Pissodes strobi.*—*Nat. Canad., Quebec,* xlvii, no. 10, April 1921, pp. 218–224.

A great deal of damage to white pine (*Pinus strobus*) is caused by the weevil, *Pissodes strobi*. The eggs are laid in the inner pulpy bark or corky tissue of the terminal shoots during April, May and June. They hatch in about a week, and the larvae feed under the bark. In Canada only one generation occurs annually. Pupation takes place about the middle of the summer and lasts from two to three weeks. Hibernation occurs in the adult stage, and oviposition does not take place until the following spring. For the protection of ornamental trees sticky bands may be used ; the other remedial measures advocated have already been noticed [*R.A.E.*, A, vi, 62].

DEGRULLY (L.). **Contre la Cochylis et l'Eudémis.**—*Progrès Agric. & Vitic., Montpellier,* lxxv, no. 21, 22nd May 1921, pp. 493–495.

In view of the price of nicotine, the use of arsenicals is indicated for combating the vine moths [*Clysia ambiguella* and *Polychrosis botrana*], and various formulae for the preparation of such sprays are quoted.

VAYSSIÈRE (P.). **Le "Ver Rose" de la Capsule du Coton.**—*Agron. Colon., Paris,* vii, no. 40, April 1921, pp. 118–127, 2 plates.

It is stated in a footnote to this paper that *Platyedra* (*Pectinophora*) *gossypiella*, Saund., has been recently found in French West Africa. The paper deals with its bionomics and control in various other infested countries.

QUANJER (H. M.). **Guide pour l'Inspection aux Champs et pour la Sélection des Pommes de Terre.**— *Verslagen & Meded. Plantenziekt. Dienst, Wageningen,* no. 6a, April 1921, 31 pp., 4 plates.

Potato plants quite close to trees or bushes may be infested by Rhynchota that feed on the leaves. The injury is negligible, but is easily confused with mosaic disease. The latter is transmissible in various ways ; Aphids are responsible for bridging distances of 20 yds. or more between diseased and healthy plants. Such transmission by Aphids occurs chiefly near hedges.

Feytaud (J.). **Les Vers de la Grappe, Cochylis et Eudémis.** [The Vine Moths, *Clysia ambiguella* and *Polychrosis botrana*.]—*Progrès Agric. & Vitic., Montpellier,* lxxv, no. 20, 15th May 1921, pp. 473–474.

French viticulture suffers severe losses from the vine-moths, *Clysia ambiguella*, Hb., and *Polychrosis botrana*, Schiff. The latter, which appeared in 1890, is increasing, while the former, which is a much older pest, is abundant only in limited areas. Traps and sprays are the chief combative methods during the season of injury, from May to September. To get the best results the sprays must be applied just before the caterpillars hatch and every part of the bunches must be carefully covered. Arsenical sprays may be used in spring; in summer, nicotine must be used.

Bouvier (E. L.). **Sur l'extraordinaire Abondance des Bourses du Bombyx Cul-brun** (*Euproctis chrysorrhoea*, **L.**) **dans certaines Régions du Poitou.**—*Bull. Soc. Path. Vég. France, Paris,* vii, no. 1, January-March 1920, pp. 11–12. [Received 21st May 1921.]

An enormous number of webs of the brown-tail moth, *Nygmia phaeorrhoea* (*Euproctis chrysorrhoea*) was observed in Poitou in September 1920, and in asking for immediate measures attention is drawn to the law of the 26th Ventôse, year iv of the Republic [March 1796] specially enacted against this pest.

Lesne (P.). **Une ancienne Invasion du "Botys du Millet"** (*Pyrausta nubilalis*, **Hb.**) **en France.**—*Bull. Soc. Path. Vég. France, Paris,* vii, no. 1, January-March 1920, pp. 15–16. [Received 21st May 1921.]

Referring to a recent note on the parasites of *Pyrausta nubilalis*, Hb., observed in France [*R. A. E.*, A, viii, 120], the author states that he obtained them when breeding this moth during the outbreak of 1886–1887, which began in fields of hemp (*Cannabis sativa*) in the valley of the Lot, and was probably brought to an end by natural enemies.

Cotte (J.). **Deux Parasites de la Figue sauvage.**—*Bull. Soc. Path. Vég. France, Paris,* vii, no. 1, January-March 1920, pp. 26–30, 2 figs. [Received 21st May 1921.]

Tylenchus sycobius, sp. n., and a mite, *Eriophyes ficus*, sp. n., are described from wild figs in France. The new Nematode is closely allied to *T. dipsaci*, Kühn, and it may be of importance, as the cultivated fig is largely grown in some parts of Provence.

Vayssière (P.). **La Cécidomyie des Violettes** (*Perrisia affinis*, **Kieffer**).—*Bull. Soc. Path. Vég. France, Paris,* vii, no. 1, January-March 1920, pp. 31–33. [Received 21st May 1921.]

In 1918 Picard drew attention to an increase of *Perrisia affinis*, Kieff., in the violet-growing areas near Hyères [*R. A. E.*, A, vii, 426]. Quite recently the author has found at Marseilles *Viola odorata* with all its leaves deformed by this Cecidomyiid, and injured examples of the same plant growing in Paris have also occurred.

Frequently turning over the soil, and dusting the plants with slaked lime or other powdery substances, such as fresh pyrethrum, are methods that may be tried. Where violets are grown commercially, experiments with hydrocyanic acid gas should be made.

LESNE (P.). **Une Invasion récente de l'***Eurytoma* **des Amandes** (*E. amygdali,* **G. End.) dans la Région syrienne.**—*Bull. Soc. Path. Vég. France, Paris,* vii, no. 2, April–June 1920, pp. 44–46. [Received 21st May 1921.]

The phytophagous Chalcid, *Eurytoma amygdali,* occurs in Syria, where its larva does severe damage to almonds [*R. A.E.*, A, v, 374]. No methodical study of combative measures has been made. Sprays might be applied either to repel the females or to kill the newly-hatched larvae. Infested material should be kept in receptacles permitting the parasites of this pest to escape. The author has obtained a Chalcid parasite, unfortunately in too bad a condition for identification. A Salticid spider takes up its abode in the holed almonds and sometimes captures *E. amygdali.*

PUTTEMANS (A.). **Observations sur la Biologie du** *Tylenchus devastatrix,* **Kühn.**—*Bull. Soc. Path. Vég. France, Paris,* vii, no. 2, April–June 1920, pp. 66–67. [Received 21st May 1921.]

In exceptional cases *Tylenchus devastatrix,* Kühn, may attack the aerial parts of a plant, possibly when there is a lack of humidity in the soil. In 1905 in Brazil the author observed this Nematode infesting such portions only of lucerne (*Medicago sativa*). This was at the end of the dry season, and the attack ceased with the spring rains. *Heterodera radicicola,* which was also present, confined itself to the underground parts of the plants.

COTTE (J.). **Une Invasion de** *Deilephila lineata,* **F., var.** *livornica,* **Esp. (Lépid.) en Provence.**—*Bull. Soc. Path. Vég. France, Paris,* vii, no. 3, July–September 1920, pp. 76–79.

In the spring of 1920 an outbreak of *Deilephila lineata* var. *livornica* was observed in vineyards in the department of Bouches-du-Rhône. An outbreak of a similar, and perhaps the same, caterpillar also occurred in Var. These outbreaks are probably due to a temporary relaxation of natural control. The winter was particularly mild, and insects not usually seen at that period of the year occurred in consequence.

VAYSSIÈRE (P.). **Quelques Insectes nuisibles aux Cultures méridionales en 1920.**—*Bull. Soc. Path. Vég. France, Paris,* vii, no. 4, October–December 1920, pp. 124–128. [Received 21st May 1921.]

The following were among the insect pests noticed in the department of Bouches-du-Rhône in the spring of 1920:—Coleoptera: the Chrysomelids, *Cassida deflorata* on artichoke and *Colaspidema atrum* on lucerne; and the weevils, *Hypera* (*Phytonomus*) *variabilis* on lucerne, *Rhynchites cupreus* on cherry, and *Anthonomus pomorum* on apple. Lepidoptera: *Cnethocampa pityocampa* on pine, *Malacosoma neustria* on various trees, including oak, fruit trees, and especially almond, *Porthetria* (*Lymantria*) *dispar* on oak, *Diloba coeruleocephala* on almond,

and a Zygaenid, *Aglaope infausta*, which, after *M. neustria*, was the most serious almond pest during the year. Arsenical sprays, applied in summer or after the crop has been gathered, are advised against the last-named.

DIFFLOTH (P.). **La Lutte contre les Insectes nuisibles.**—*La Vie Agric. & Rur., Paris,* xviii, no. 22, 28th May 1921, pp. 349–353, 4 figs.

This article aims at making known the economic value of applied entomology. The cases mentioned are those of dangerous plant pests checked by parasitic insects.

THOMSEN (M.). **Barkvikleren.** [The Bark Tortricid.]—*Gartner-Tidende, Copenhagen,* xxxvi, 1920, pp. 189–191.

The Tortricid, *Enarmonia* (*Laspeyresia*) *woeberiana*, is here recorded for the first time as a pest in Denmark. The larva attacks various fruit trees, making irregular burrows in the bark and on the surface of the wood ; on stone-fruit trees it causes extensive bark wounds and exudation of gum ; on pear and apple trees the wounds are mostly canker-like. Pupation occupies rather a long period, there being only one generation of the moth a year.

To prevent oviposition the wood should be cleaned and smeared with lime or wood-tar. Similar treatment with a putty consisting of 2 pints clay, 2 pints cow-dung and 1 pint slaked lime or wood ash, with sufficient water to make a thick paste, is recommended for preventing the escape of the moth from the wood.

SIGGAARD (N.). **Om Frömidder og deres Bekaempelse.** [On Seed Mites and Measures against them.]—*Tidsskr. for Planteavl, Copenhagen,* xxvii, 1920, pp. 287–312.

Several large stores of seeds in Denmark, especially those of crucifers, have been heavily infested by mites, the species concerned being *Tyroglyphus farinae*, *T. putrescentia* and *Glyciphagus domesticus*. The first of these did the most damage, while *G. domesticus* possibly only feeds on the shells of the seed, fragments of straw, and other waste matter. A predaceous mite, *Cheyletus eruditus*, was found feeding on the Tyroglyphids. A characteristic periodicity appeared in the number of mites ; when the Tyroglyphids had become numerous the predaceous mites also increased in number until they almost exterminated them. It was found that the mites were dependent to an important extent upon temperature and moisture, and the amount of water in the seed itself was of importance. A measure recommended against them is desiccation of the seed at 40–50° C. [104–122° F.], an apparatus being used by which the seed is moved about during the drying process.

FERDINANDSEN (C.) & ROSTRUP (S.). **Oversigt over Sygdomme hos Landbrugets og Havebrugets Kulturplanter i 1919.** [Report on Insect Pests and Fungus Diseases of the Field and Orchard in 1919.]—*Tidsskr. for Planteavl, Copenhagen,* xxvii, 1920, pp. 399–450.

Among cereal pests, *Oscinella frit* did great damage to late sown oats and barley. *Chlorops taeniopus* and *Phyllotreta vittula* were

also rather common on barley, and *Zabrus gibbus* injured it considerably in certain localities. Less damage was due to *Mayetiola* (*Cecidomyia*) *destructor* on barley, *Contarinia* (*C.*) *tritici* and *Sitodiplosis mosellana* (*C. aurantiaca*) on wheat, *Cephus pygmaeus* and *Hadena secalis* on rye, and *Apamea testacea, Lema cyanella* and *L. melanopa* on oats. Thrips were numerous (*Limothrips denticornis* on rye and barley, and *Thrips cerealium* on oats), but the plants did not suffer much from them. The Aphid, *Macrosiphum granarium* (*Siphonophora cerealis*) did not appear in any numbers, but the mite, *Tarsonemus spirifex,* was numerous in certain localities on oats.

Tenebrio molitor and *Calandra granaria* infested stored grain.

On peas and vetches *Sitona lineata* was very numerous and injurious, especially in late sown fields. *Kakothrips pisivora* (*Physopus robustus*), Aphids and the larvae of *Cydia* (*Grapholitha*) were found on peas, but not in any number.

Among pests of crucifers, *Silpha opaca,* the larvae of which appeared in dry weather in May and June in immense numbers, destroyed sugar-beet and red beet everywhere, especially in Jutland. *Pegomyia hyoscyami* (*Anthomyia conformis*) also did much damage in southern Denmark. *Phorbia* (*Chortophila*) *brassicae* destroyed 90 per cent. of the cabbages in certain localities ; and *Phyllotreta nemorum, P. atra* and other flea-beetles attacked rape in immense numbers, especially in the dry early summer, and also crucifers in gardens. *Brevicoryne* (*Aphis*) *brassicae* destroyed cabbages in gardens in late summer, especially where manure had not been used. *Meligethes aeneus* and *Ceuthorrhynchus assimilis* did much damage in rape and turnip fields in early summer. *Perrisia* (*Cecidomyia*) *brassicae* was very numerous and did much damage to turnips cultivated for seed. *Cassida nebulosa, Pieris* larvae, *Plutella maculipennis* (*cruciferarum*), *Eurydema oleracea* and *Aphis rumicis* (*papaveris*) were minor pests of these crops.

Carrots were especially attacked by *Psila rosae*, and in some localities 95 per cent. of the crop was rendered unfit for human food. *Trioza viridula* also did so much damage that in some places the cultivation of carrots had been abandoned.

Celery was infested with the mines of *Acidia heraclei*, and potato pests included *Calocoris bipunctatus, Silpha opaca, Hydroecia micacea* and *Apamea testacea.*

Sitona lineata, Hypera (*Phytonomus*) *variabilis, Apion apricans* and *Bryobia* sp. occurred on lucerne and clover, and *Hadena secalis* and *Oligotrophus alopecuri* on fox-tail grass.

Apple and pear pests included : *Cheimatobia brumata, C. boreata, Argyroploce* (*Olethreutes*) *variegana, Eucosma ocellana, Hyponomeuta malinellus, Diloba coeruleocephala, Malacosoma neustria, Anthonomus pomorum, Psylla mali*, and the bugs, *Calocoris* sp., *Lygus* sp. and *Atractotomus ulmi.* Aphids and scale-insects (*Lepidosaphes ulmi*) only appeared in small numbers. *Cydia* (*Carpocapsa*) *pomonella* was not numerous in the fruit, but *Argyresthia conjugella* was common [*R.A.E.*, A, ix, 195].

Hoplocampa fulvicornis did much damage to plums, and the Aphids, *Myzus cerasi* and *Hyalopterus pruni,* were minor pests of stone fruits.

Raspberries were attacked by *Anthonomus rubi, Byturus tomentosus* and *Otiorrhynchus* sp.

Gooseberries, currants and black currants suffered from attacks of *Pteronus ribesii, Pristiphora pallipes* (*appendiculatus*), *Cheimatobia*

brumata and *Tortrix* sp.; against the Lepidopterous larvae tobacco extract was used with effect, as were sprays of strong slaked lime against *Incurvaria capitella*. *Aphis grossulariae*, *Eriosoma* (*Schizoneura*) *ulmi*, *Lecanium* sp., *Calocoris* spp., *Lygus* spp., *Bryobia ribis* and *Eriophyes ribis* were also recorded on currants.

From strawberries *Anthonomus rubi*, *Hypera* (*Phytonomus*) sp., *Blennocampa geniculata* (against which sprays of tobacco extract containing 1 per cent. nicotine were successful), *Apamea testacea*, thrips, *Aphrophora spumaria*, and, especially, *Tarsonemus fragariae* were recorded.

On onions and leeks rather heavy infestations by *Leptohylemyia antiqua* and *Acrolepia assectella* occurred.

Phytomyza affinis caused serious damage to the foliage of cultivated *Chrysanthemum*; *Forficula auricularia* attacked dahlias; the mite, *Rhizoglyphus echinopus*, narcissus bulbs; the Aphid, *Siphocoryne ligustri*, privet; *Chermes piceae*, silver firs; *Hyponomeuta padellus*, hawthorn; and *Eriophyes avellanae*, hazel.

Agriotes lineatus, *Melolontha melolontha* (*vulgaris*), *Phyllopertha horticola*, *Tipula oleracea*, *Euxoa* (*Agrotis*) *segetum* and other cutworms, and *Blaniulus guttulatus* did much damage to various plants.

Öhlers (H.). **Om Udnyddelse af Myrer.** [On the Destruction of Ants.]—*Haven, Copenhagen*, xx, 1920, pp. 65–68.

The best method of destroying ants in houses has proved to be fumigation with hydrocyanic acid for four or five hours; boiling water poured into the nest, and cups containing a solution of sugar mixed with arsenic placed in the runs of the ants were also effective.

Loos (K.). **Massnahmen zur Bekämpfung der Nonne.** [Measures against the Nun Moth.]—*Vereinsschr. Forst-, Jagd- u. Naturk., Prague*, 1920–21, nos. 4–6, 7–9, pp. 85–93, 154–158.

With reference to the recent migration into Czecho-Slovakia of huge swarms of nun moths [*Liparis monacha*], one instance of which has been noticed [*R.A.E.*, A, ix, 226], it is supposed that the migration itself and the appearance of the moths at a somewhat earlier date than usual are due to complete defoliation and consequent absence of food in the region of origin. Lack of food entailed a compulsory early pupation, and the moths, after emerging prematurely, were compelled to migrate in search of suitable breeding places.

The progeny of the migrant moths do not appear capable of development to the same extent as do native specimens. Furthermore, the oviposition of the immigrant moths was about a fortnight in advance, and many of the eggs must hatch in autumn, the resulting caterpillars being exposed to bad weather later on. Other eggs must hatch very early in the following year, and a spell of bad weather will prove equally destructive to them.

Lack of knowledge of the biology of the nun moth, however, makes it impossible to predict the consequences in 1921 of the invasion of 1920, and various remedial measures are therefore described. Egg destruction is of little use at the beginning of an outbreak, as at that time the eggs are concealed; but the collection of eggs is highly important as a means of estimating the amount of infestation to be expected. Banding is a useful measure. Crushing or painting with

banding adhesive or limewash may be employed against the compact masses of newly hatched caterpillars. Collection of the caterpillars and pupae must not be followed by their destruction, as the latter involves that of parasites. Collection of the female moths is a most valuable measure. Experiments with light-traps have shown them to be costly and ineffective.

If an outbreak is thought possible, forestry operations should be regulated accordingly. The areas for clear felling should be chosen to include places where oviposition has been abundant in order that clearing may destroy the eggs. Thinning is also a valuable measure, for not only are eggs destroyed, but the increase of light and air favour Tachinid and other enemies of the nun moth, and the caterpillars are more exposed to inclement weather.

The concluding part of this paper gives figures showing the potential natural increase of the nun moth, in order to emphasise the absolute necessity for combative measures in the early stages of infestation.

BOLLE (G.). **La Tignola della Farina e la sua Distruzione.** [The Flour Moth and its Destruction.]—*Allevamenti, Palermo,* ii, no. 5, 1st May 1921, pp. 138–144, 10 figs.

The information given here on *Ephestia kühniella* and its destruction by fumigation with hydrocyanic acid gas is repeated from another source already noticed [*R.A.E.*, A, viii, 486].

SMITS VAN BURGST (C. A. L.). **Hyperparasitisme bij primaire Parasieten van de gestreepte Dennenrups** (*Panolis griseovariegata,* **Goeze). Superparasitisme.** [Hyperparasitism noticed in primary Parasites of the Pine Caterpillar, *Panolis flammea* (*griseovariegata*).] *Tijdschr. Plantenziekten, Wageningen,* xxvii, no. 4, April 1921, pp. 45–49.

Though generally confined to particular insect hosts, Hymenopterous parasites sometimes infest others, even of different orders. Variations are to be expected when a Hymenopterous parasite of a phytophagous insect begins to infest an entomophagous one, thus changing from a primary parasite to a hyperparasite.

In connection with the author's paper on the parasites of the pine moth, *Panolis flammea*, Schiff. [*R.A.E.*, A, ix, 86], he has received a record, published in 1914 by K. Pfankuch, of *Ichneumon nigritarius*, Grv., and *Microcryptus arrogans*, Grv. (both parasites of *P. flammea*) parasitising *Banchus femoralis*, Ths., another parasite of the pine moth, of which they thus appear to have become hyperparasites.

Ratzeburg has imagined an instance in which two different parasites infest a caterpillar, which is still able to pupate, when a third parasite infests the cocoon. Owing to lack of food two of the parasitic larvae perish, and this may lead to the assumption that third degree parasitism has occurred, whereas in fact the host has harboured three primary parasites. It is possible that the surviving parasitic larva may eat the others.

The author thinks it not improbable that a race of secondary parasites can originate in cases where several primary parasites meet in a common host, and this may explain to some extent the instance recorded by Pfankuch.

JENSEN (H.). *Lasioderma* **en Tabaksmot.** [*Lasioderma serricorne* and the Tobacco Moth.]—*Meded. Proefst. Vorst. Tabak, Klaten,* xxx, 1917, 29 pp. [Received 17th May 1921.]

This bulletin describes trials with various insecticides against *Lasioderma serricorne* and the tobacco moth [*Setomorpha margalaestriata*].

The quantity of carbon bisulphide (270 c.c. per cu. metre) advised [*R.A.E.*, A, vii, 29] for use in the Dutch East Indies was found to be excessive. In the Vorstenland fumigation rooms 100–150 c.c. sufficed; less than 100 c.c. should not be used. The combustibility of tobacco is not affected by the carbon bisulphide. Benzine is satisfactory if enough is used to saturate the air and it is allowed to act for 5–6 days. *L. serricorne* is unaffected by the fumes of formalin or those of burning sulphur. Tobacco store-rooms may be protected against both pests by screening the doors and windows with cotton fabric, or each bale or pile of bales may be wrapped in the material. *L. serricorne* can penetrate the matting used to cover the bales. When inspecting store-rooms, it is necessary to be on the watch for rice, cacao sweepings, etc., as well as for tobacco debris.

RAMIREZ (R.). **Plagas de la Agricultura en el Distrito Federal.**—*Rev. Agric., San Jacinto, D.F.,* v, no. 9, January 1921, pp. 662–663.

Insect pests recorded from the Federal District of Mexico include termites and certain Orthoptera which are injurious to Gramineae, lucerne, etc. Winged locusts occasionally appear, but do not constitute a serious danger.

Rhynchota include many Aphids and Coccids, and among Lepidoptera are *Pieris rapae* on cabbage; *Clisiocampa azteca,* the larvae of which weave large nests in the branches of willow; *Heliothis obsoleta* (*armigera*) on maize; *Laphygma frugiperda* on lucerne and other plants; and *Sitotroga* (*Gelechia*) *cerealella* in ears of maize.

Diptera include *Tipula simplex,* the larvae of which feed on the roots of lucerne, barley and oats, while *Drosophila* larvae devour ripe fruit. Coleoptera include *Lioderma yucateca* on American agaves; *Tenebroides corticalis, Silvanus surinamensis* and *Laemophloeus pusillus* in stored grain; *Epilachna corrupta* on beans; *Thaptor oblongus,* injurious to dry wood; and *Amphicerus punctipennis,* destructive to maize. *Euphoria basalis* is found on the flowers of pumpkin, but does not seem to cause injury. Many Lamellicorns in the larval stage attack the roots of various plants; *Ligyrus rugiceps* infests maize stalks; *Macrodactylus subspinosus* is a serious pest of maize and other plants; *Aphagiognathus hybostoma* mines the trunks of willows; *Acanthoderes funerarius* is frequently found in American agaves, but is not known to cause damage; *Leptinotarsa multitaeniata* is a serious pest of potatoes; *Bruchus* spp. attack leguminous seeds and dry cotton fibres; and *Tenebrio molitor* is a pest in mills and bakeries. Other Coleopterous pests are *Epitragus metallicus* on peaches and rose trees; *Echocerus cornutus, Tribolium confusum* and *T. castaneum* (*ferrugineum*) in maize; *Apion calcaratipes* in beans; *Nicentrus testaceipes* in maize; *Heilipus lauri* infesting avocado pear; *Calandra granaria* and *C.* (*Sitophilus*) *oryzae* in stored grain; *Sphenophorus spinolae* in the decayed shoots of *Nopalea coccinellifera* (cochineal

cactus) ; *Scyphophorus acupunctatus* in American agaves ; *Anthonomus augenii* in chillies ; and *Dendroctonus valens, D. mexicanus* and *Ips* (*Tomicus*) *mexicanus* in coniferous trees.

Hymenoptera include *Paururus* sp. boring in cedars, and *Amphibolips coccinea* forming galls on evergreen oak.

Cultivo de la Sandía. [Water-melon Growing.]—*Rev. Agric., San Jacinto, D.F.*, v, no. 10, February 1921, pp. 689–697, 7 figs. [Received 28th May 1921.]

The chief pests of water-melons in Mexico are : *Diaphania* (*Margaronia*) *hyalinata* (melon caterpillar), which devours the leaves only of water-melon and the leaves and fruit of melon ; *Aphis gossypii*, which attacks water-melon foliage ; *Diabrotica vittata* (striped cucumber beetle), which attacks the young plants in spring, while its larvae at the same time destroy the roots, and *Crepidodera cucumeris*, a flea-beetle that damages the young plants. The best preventive against these pests is rotation of crops, so that they will be deprived of their food-plants for a sufficient period of time to kill them. Plants infested with chewing insects should be sprayed with 4 oz. Paris green in 50 gals. of water, this being sufficient if applied three times at intervals of a week. A solution of 5 per cent. lead arsenate may be used as a spray once a week. For sucking insects, petroleum emulsion (1 part to 20 water) should be applied in the intervals between the other sprays. For slight infestations 1 lb. of whale-oil soap per gallon of water can be substituted for the oil emulsion, and for urgent cases fumigation of the plants with carbon bisulphide under a bell-jar is an efficient remedy.

INDE (J. R.). **Un Insecto Descortezador del Cedro.** [A Bark-destroying Pest of Cedar.]—*Mem. Rev. Soc. Cien. "Antonio Alzate," Mexico*, xxxviii, no. 11–12, January 1921, pp. 401–405, 2 figs.

An undetermined beetle of the genus *Phloeosinus* is recorded as constructing galleries in the bark and wood of cedar (*Cupressus*) in Mexico. There is one generation a year, oviposition occurring in October ; the larvae construct galleries in which they hibernate until the following spring ; mating has been observed in July, and the fertilised females penetrate the bark and construct fresh galleries. A quantity of resin exudes from the entrance holes, by which the presence of the beetles may be detected. Attacks generally begin with the highest branches or the top of the trunk. When the lower branches or base of the trunk are found to be infested, the tree cannot be saved, and should be cut down at once, all the bark removed and burnt and the wood beneath lightly charred in order to kill both larvae and adults. Trees more lightly infested should have the affected branches cut off and burnt, or infested portions of bark removed, and the wounds painted over.

AULLÓ (M.). **Las Plagas de** *Lyda hieroglyphica*, **Christ., en España.**—*R. Soc. Esp. Hist. Nat., Madrid*, Spec. Vol., 1921, pp. 16–18, 1 plate.

The sawfly, *Lyda hieroglyphica*, Christ., appears in Spain in the adult form in late May or early June and deposits eggs singly in the needles on the tips of the upper shoots of pines. These hatch in about

ten days, and the larvae weave a nest, in the shelter of which they feed. Young trees are preferred for attack, such as *Pinus sylvestris* of 2 years or *P. pinea* and *P. pinaster* of 6 to 8 years old ; in the latter case several larvae may be found in the same shoot, and the lateral shoots also may be attacked. About mid-July or early August the larvae descend to the ground, where they pass the winter, pupating in the following spring shortly before the adults appear. Infestations in Spain differ from those recorded from other countries in the number of larvae found on a shoot and in the age of the trees attacked. In small areas, hand collection of the nests, which are very conspicuous in June and July, is recommended ; on larger areas sprays of 3 lb. anhydrated sodium arsenate to 100 gals. of water with 6 lb. of lime have been found a successful remedy.

MERCET (R. G.). **Notas sobre Afelininos (Hym. Chalc.).**—*R. Soc. Esp. Hist. Nat., Madrid,* Spec. Vol., 1921, pp. 299–309, 4 figs.

Included in this list of Aphelinines, described prior to the author's monograph of 1912, are *Aphelinus chilensis,* How., a parasite of *Aspidiotus hederae* on *Hedera helix* ; *Mimatomus peltatus,* Ckll., a parasite of *Aleurodes pruinosus euphorbiarum* ; *Prospaltella brasiliensis,* Hemp., and *Eretmocerus paulistus,* Hemp., from *Aleurodes horridus,* Hemp., on branches of orange ; *Aspidiotiphagus aleurodis,* Ashm., parasitic on *Aleurodes* sp. attacking sugar-cane ; *Physcus testaceus,* Masi, parasitic on *Lepidosaphes ulmi* ; and *Prospaltella* (*Doloresia*) *conjugata,* Masi, reared from *Aleurodes brassicae* on *Brassica oleracea.*

BENAIGES DE ARÍS (C.). **Regeneracion del Olivar.** [Re-development of the Olive Plantations.]—*Bol. Agric. Téc. Econ., Madrid,* xiii, no. 148, 30th April 1921, pp. 313–358, 14 figs.

This paper is a revision of one previously noticed [*R. A.E.*, A, v, 138]. In addition to the pests dealt with in the former account, namely, *Saissetia oleae* and *Phloeotribus scarabaeoides* (*oleae*), particulars are given of *Dacus oleae* and *Prays oleellus,* and of suitable treatments for them [*R. A.E.*, A, ix, 278], and of *Phloeothrips oleae,* of which there are three or four generations a year in Spain. The process of fumigation with hydrocyanic acid gas under tents is described, as well as the usual arsenical sprays. *Psylla oleae* is found chiefly in very sheltered localities and during dry seasons, forming a soft, cotton-like substance which prevents the normal development of flowers and fruit. The best time for measures against this insect is the winter, after gathering the crops, and in spring when the cottony matter appears. During pruning, all galls and excrescences should be removed, and the trees should then be sprayed with a solution of 4 lb. soap to 10 gals. of water. Fumigation with hydrocyanic acid gas is also recommended, as well as nicotine-soap solutions, for both this and other insects.

MAAS (J. G. J. A.). **Herkenning en Bestrijding van de voornaamste Ziekten en Beschadigingen van** *Hevea brasiliensis.* [The Recognition and Control of the principal Diseases of and Injuries to *H. brasiliensis.*]—*Meded. Algemeen Proefst. A.V.R.O.S., Medan,* Rubber Ser., no. 28, 1921, 12 pp.

In this concise account of the principal diseases and insect pests likely to occur on *Hevea brasiliensis,* the first chapter enumerates the

Dutch, vernacular, and scientific names of the pests or diseases concerned and the nature and appearance of the injury. The second describes the remedies advocated.

The insect pests include *Coptotermes gestroi*, boring the roots and stems; a beetle, *Platypus* sp., which mines the stem, starting from a point where the bark is absent or injured; and mites, which attack the young leaves, especially in seed-beds.

C. gestroi may be destroyed by fumigation, a mixture of three parts arsenic and one part sulphur being burned in one of the commercial apparatuses that are now obtainable. In localities where this termite occurs, all tree stumps and dead timber must be removed and burned. Infestation by *Platypus* may be prevented by painting all wounds with a thick coat of tar mixed with fine sand, with a mixture of one part solignum and one part petroleum, or with one part of paraffin and naphthaline. The surface may also be painted with linseed oil, petroleum, etc., prior to the application of a coat of tar; a coat of tar alone may sometimes prove inadequate to prevent the beetle from entering. Beetles already in the wood may be killed by binding the wounds with sacking steeped in petroleum. Mites need no special measures; they usually disappear after heavy rain.

Cohen Stuart (C. P.). **Hooge Produktie door zorgvuldigen Pluk en Insektenbestrijding.** [High Production through careful Plucking and Insect Control.]—*De Thee, Buitenzorg*, ii, no. 1, March 1921, pp. 5–7.

A communication from the manager of a 115-acre tea estate emphasises the importance of careful plucking and sufficient insect pest control as factors in remunerative production. A table covering the years 1914–20 shows for each year the crop yields, the number of *Helopeltis*, caterpillars and cocoons collected, and the costs per acre and per lb. of dried leaf. The average cost of control was about 8*s*. 4*d*. per acre (at par) or 1*s*. 3½*d*. per cwt. of dried leaf. The estate maintenance costs varied from about 34*s*. per acre in 1914 to 65*s*. in 1920.

Keuchenius (A.). **Proeven over de Schade door de Theezaadwants veroorzaakt.** [Tests on the Injury caused by the Tea Seed Bug.]—*De Thee, Buitenzorg*, ii, no. 1, March 1921, pp. 9–12, 2 plates.

In view of the reported damage to tea seed by a Pentatomid bug, *Poecilocoris hardwicki* [*R.A.E.*, A, viii, 453], experiments were made to ascertain if the piercing of the berries seriously injures the seed and causes the "white spots" on the seed-lobes thought by some to be due to fungi.

Four cages were arranged on different twigs of the same plant and in each of two of them about 100 bugs were placed. After 2½ months it was found that the berries in the control cages were quite normal, and a test of the resultant seeds showed that only 33 per cent. floated, and that there was a germinating power of 74 per cent. In the cages where the bugs were present, about 40 per cent. of the young berries failed to develop and withered on the twigs. On opening the remaining—apparently normal—berries, all the seeds floated when tested. Externally these seeds were more or less shrivelled, and in 29 per cent. of them the seed-lobes and germs were shrivelled. The

" white spots " were seen on these shrivelled lobes and are probably due to a poison injected when the puncture is made. If the puncture reaches the germ the latter probably ceases to grow. Fungi may appear on these spots, but only in a secondary manner, and it is almost certain that the white spots result from the punctures of the bugs.

In a further experiment made in October 1919 to test the rapidity of the decrease in germinating power in seeds injured by *P. hardwicki* it was found after 1½ months that the percentage of heavy (sinking) seeds had greatly decreased, in one case from 53 to 6 per cent. The germinating power also greatly decreased, from 75 to 9 per cent.; the test conditions were, however, more severe than in nature, where less bugs and more food material would be present.

MENZEL (R.). **Over het Optreden van de "Walang Kajoe" in de Thee.** [The Occurrence of *Cyrtacanthacris melanocornis* on Tea.] —*De Thee, Buitenzorg,* ii, no. 1, March 1921, pp. 12–13, 1 plate.

The locust, *Cyrtacanthacris melanocornis,* attacks tea and, more especially, dadap [*Erythrina*]. It is mainly found at the edges of teak forests and in open places within woods. Its food-plants include coconut, maize, banana, coffee, etc. The trouble is usually of a temporary nature, as the locusts are constantly shifting their feeding grounds. The eggs are laid at the end of the west monsoon, and the young usually appear when the rains set in again in November and December, sometimes later. The infestation is therefore at its height at the end of the rainy season.

MENZEL (R.). **Mijten in Theezaad.** [Mites in Tea Seed.]—*De Thee, Buitenzorg,* ii, no. 1, March 1921, pp. 13–15, 1 plate.

Early in 1921 some of the seeds in parcels from British India were found to be entirely destroyed by mites present in large numbers. The external appearance of the seeds was unaltered, but when opened they were found to be full of a reddish-brown dust swarming with cheese mites, *Tyroglyphus* sp. The mites were only found in seed that floated when tested. They—and probably all other Tyroglyphids —spread by attaching themselves when in the hypopial stage to flies, small rodents, etc. They are preyed upon by a larger Tetranychid mite of the genus *Cheyletus.*

Tyroglyphids possess no special breathing organs, thus nullifying fumigation. Heating to 50° C. (122° F.) appears to be the best method of killing them, but this often destroys the infested material. It is very desirable that attention should be given in the packing sheds to these pests in British India; it is, of course, quite possible that the mites also occur in the Dutch East Indies.

MANCHERON (P.). **Malattie degli Agrumi nel Marocco.** [Diseases of Citrus Plants in Morocco.]—*La Colonisation française au Maroc, Casablanca,* i, 1920, p. 7. (Abstract in *L' Agric. Colon., Florence,* xv, no. 5, May 1921, p. 290.)

Insect enemies of *Citrus* in Morocco include *Aphis aurantii* which attacks the young shoots of oranges, especially mandarins, in spring. *Ceratitis hispanica* oviposits in the fruits; the only remedy is to collect and destroy the fallen fruits. The most dangerous pests

of *Citrus* are the scales, *Pseudococcus* (*Dactylopius*) *citri* and *Lepidosaphes beckii* (*Mytilaspis citricola*). They may be combated by spraying in spring with lime-sulphur after a preliminary pruning.

Jarvis (E.) **An Account of a New Moth Borer of Sugar Cane (Family Tineidae); together with Further Notes on the Pyralid Moth Borer of Cane** (*Polyocha* **sp.**).—*Queensland Bur. Sugar Expt. Sta., Div. Ent., Brisbane,* Bull. 11, 1921, 15 pp., 1 plate.

A Tineid moth-borer, which has not previously been recorded as injurious to sugar-cane in Queensland, attacks the crops at a very early stage of growth, chiefly among the third ratoons. The eggs are attached to the cane stalk close to a node, not hidden by the leaf-sheath. Like *Phragmatiphila truncata,* Wlk., the larva severs the central core of the stem, causing the heart-leaves to wither. It then tunnels either downwards or upwards, but never feeds on or inhabits the central rotting core. When exposed to view, it crawls into the light. The larvae leave the cane and pupate in the ground or in dead twisted leaves, the pupa being concealed in a frail cocoon.

The Pyralid moth-borer, *Polyocha* sp., which causes serious injury to ratoons is similar in external appearance to *P. truncata*. The larvae tunnel above the basal portions of shoots, frequently gnawing the internal tissue. Their presence can be detected by a single irregular hole at the bottom of affected ratoons. They hide when exposed to view. When fully grown the caterpillar eats a hole through the side of the cane and pupates below the opening, inside the cane shoot. The pupal stage occupies 26 days. There are two natural enemies: a Braconid parasite and the predaceous larva of an Elaterid beetle (*Agrypnus* sp.).

In river flats, liable to flood, as many as 25 per cent. of the cane shoots may be destroyed by this Pyralid. On higher ground the damage is not so severe, perhaps because of the presence of predaceous insects such as the ant, *Pheidole megacephala*.

Whether remedial measures would produce a heavier crop is uncertain. Perhaps after harvesting, "shaving" the cane stools might be found beneficial in reducing suckers springing from buds exposed to direct sunlight.

Woglum (R. S.). **Bettering the Citrus Pest Control Situation.**—Separate from *California Citrograph, Los Angeles,* March 1921, 1 p., 1 fig.

A survey has been made of the citrus groves of Tulare County, California, to study the fumigation operations against the citricola scale [*Coccus citricola*]. This work has been most efficiently carried on, and upwards of 98 per cent. of the insects have been killed during a period of several years, most treated orchards remaining clean for two or three years. As fumigation after mid-September has not proved very satisfactory, it is hoped to begin the process earlier in the season and avoid late work. A demonstration of daylight fumigation has been given, and daylight operations have been largely practised, sometimes with considerable injury to the trees. In order to determine the limitations of daylight fumigation, a large amount of data has been collected and a dosage schedule has been issued.

Spraying as a remedy against the scale has gained great headway, and the sprayed acreage exceeds that fumigated. Further study

during the active spraying season is necessary to reach a conclusive understanding of the comparative value of spraying and fumigation. An effort is being made towards closer co-operation between research agencies and the citrus industry.

Stirett (G. M.). **Report of the Work on the Cabbage Maggot at Burlington and Vicinity.**—*16th Ann. Rept. Ontario Veg. Growers' Assoc., 1920, Toronto,* 1921, pp. 15–16. [Received 21st May 1921.]

Further experiments with mercury bichloride against the cabbage maggot [*Phorbia brassicae*] on radishes [*R.A.E.*, A., ix, 127, 128] show that this is the most effective substance yet found for the control of this pest. Two applications should be made, the first just after the beginning of egg-laying and the second five days later. Used at a strength of 1 oz. to 8 gals. of water slightly better results were obtained than with 1 oz. to 10 gals.

Caesar (L.). **The European Corn Borer.**—*Ontario Dept. Agric. 42nd Ann. Rept. Agric. & Expt. Union, 1920, Toronto,* 1921, pp. 59-63. [Received 21st May 1921.]

A brief account is given of the occurrence of the European corn-borer [*Pyrausta nubilalis,* Hb.] in Ontario [*R.A.E.*, A, ix. 147, 159, 160], the damage caused by it and general remedial measures to be adopted. It is proposed to ask the Legislature for a special grant in 1921 for the purpose of investigations with a view to discovering some practicable method of controlling this pest.

Fracker (S. B.). **Division of Insect and Plant Disease Control.**—*Bienn. Rept. 1919–20, Wisconsin State Dept. Agric., Madison,* Bull. 33, 31st December 1920, pp. 104–139, 19 figs. [Received 21st May 1921.]

The potato leafhopper [*Empoasca mali*] was more numerous than usual during 1919. Bordeaux mixture proved an efficient repellent against it, and was used in many localities combined with Black Leaf 40. The outbreaks of army worm [*Cirphis unipuncta*] during 1919 and especially 1920 proved the most severe since 1900. As the larvae appeared just as the grain was ripening, it was possible to save the crop by early harvesting. Grasshoppers were abundant in several counties; and owing to the difficulty in obtaining molasses, salt was successfully used in some cases as the attractive principle in baits for them. Special inspections have been organised to prevent the spread of the gipsy moth [*Porthetria dispar*] from New Jersey, where an extensive infestation was discovered in 1920 [*R.A.E.*, A, ix, 351.] Two small outbreaks of San José scale [*Aspidiotus perniciosus*] were recorded; the most heavily infested currant bushes were destroyed, and other attacked fruit was thoroughly sprayed with dormant strength lime-sulphur.

Harley (H. K.). **The European Corn Borer Survey.**—*Bienn. Rept. 1919–20, Wisconsin State Dept. Agric., Madison,* Bull. 33, 31st December 1920, pp. 139–144, 3 figs. [Received 21st May 1921.]

The life-history of the European corn-borer [*Pyrausta nubilalis,* Hb.] as occurring in the vicinity of Boston is described, and the scouting

work carried out with a view to discovering the possible means by which it might be introduced into Wisconsin is reviewed.

JONES (L. K.). **Diseases and Insect Injuries of Cane Fruits in Wisconsin, 1919.**—*Bienn. Rept. 1919–20, Wisconsin State Dept. Agric., Madison,* Bull. 33, 31st December 1920, pp. 149–157, 5 figs. [Received 21st May 1921.]

The insects recorded are: *Oberea tripunctata,* Swed. (cane-borer) occurring on red raspberries and once recorded on blackberries—the girdled tips of the canes should be cut and burned; *Oecanthus nigricornis,* Wlk. (tree cricket) causing injury to raspberries and blackberries by puncturing the canes for oviposition; and *Byturus unicolor,* Say, *Monophadnoides rubi,* Harris, *Agrilus ruficollis,* F. (red-necked cane-borer), *Pennisetia* (*Bembecia*) *marginata,* Harris (blackberry crown-borer), and *Lecanium* sp., all of which occur on raspberries.

Injurious Insects and other Pests.—*Kansas Agric. Expt. Sta., Director's Rept., 1918–19, Manhattan,* 1920, pp. 41–47. [Received 18th May 1921.]

The injurious insects dealt with during the year include: the Hessian fly [*Mayetiola destructor*], the corn earworm [*Heliothis obsoleta*], the apple-leaf skeletoniser [*Canarsia hammondi*], *Lachnosterna crassissima, Ligyrus gibbosus, L. relictus,* various Scarabaeids, and the Tenebrionids, *Eleodes hispilabris, E. obsoleta, E. suturalis, E. opaca* and *E. tricostata.*

The insects occurring on lucerne were *Pyralis farinalis* (meal snout moth), *Hypsopygia costalis* (alfalfa hayworm), *Loxostege similalis* (garden webworm) and *Prodenia ornithogalli* (cotton cutworm). The last-named was controlled by spraying with lead arsenate.

HINDS (W. E.) & THOMAS (F. L.). **Poisoning the Boll Weevil.**—*Alabama Agric. Expt. Sta., Auburn,* Bull. 212, November 1920, pp. 53–84, 1 plate, 16 tables. [Received 28th May 1921.]

Dusting experiments with calcium arsenate against the boll weevil [*Anthonomus grandis*] were carried out in Alabama from 1918 to 1920, details of which are described. In 1918 the rate of application varied from 1 to 5 lb. per acre at intervals of about 14 days, but the slight increase in yield did not warrant the expense of dusting. This apparent failure was partly due to weather conditions, the heat and drought controlling most of the weevils, and also to the intervals between applications being too great and the work not being continued long enough for the results to become cumulative under existing conditions. Experiments showed that the weevils will live, for a short period at least, without water and that dew is not indispensable in poisoning them. The occurrence of moisture on the plants after the poison has been applied does not increase the mortality. In 1919, experiments as to the cost of dusting with calcium arsenate showed that it is advisable to keep the acreage of cotton moderate and to make that area as fertile as possible so as to increase the productiveness while decreasing the area under cultivation. Under these conditions, should a heavy weevil infestation be indicated, the pest may be reduced to below 30 per cent. until after a full crop of bolls is beyond weevil damage by dusting every fifth day.

In all counties where the weevil has caused an average decrease in yield of more than 20 per cent. during the last five years, dusting is likely to be needed regularly each year.

Owing to the influence of meteorological conditions in controlling the weevil, it is not advisable to dust if the weather is sufficiently hot and dry for a period of more than a month, especially during the first part of the fruiting season. On the other hand, though frequent rains may wash the poison from the plants, it is advisable to dust at the usual 4 to 5 day intervals, in spite of threatening weather [*cf.* also *R.A.E.*, A, viii, 457].

HINDS (W. E.). **The Mexican Bean Beetle.**—*Alabama Agric. Expt. Sta., Auburn,* Bull. 216, March 1921, 10 pp., 1 fig., 4 plates.

The Mexican bean beetle [*Epilachna corrupta*, Muls.] is now an important pest in Alabama, having originated in Mexico. It attacks all varieties of table beans, and also soy beans and cowpeas. Eggs are laid in groups of about 50 on the lower sides of leaves and hatch in five or six days. The larvae devour the lower surface of the leaves and in the second week can completely destroy the crop. The upper membrane of the leaf protects them against weather, birds, or poison applications. Pupation takes place under a leaf, and lasts four or five days. The adults can fly, and they also feed on the leaves. The entire development takes three to four weeks. Winter is passed in the adult stage, in any favourable shelter. In the semi-arid west there are two generations a year, but in south-east Alabama there are four and possibly more.

The beetles have practically no natural enemies, being protected by a repellent fluid against predators.

Quarantine measures have been instituted by prohibiting the export of certain specified articles from the infested area.

The application of arsenical poison to the foliage is not recommended. All bean areas should be thoroughly cleaned and ploughed early in autumn or winter to bury all hibernating insects. Deeper ploughing can be practised where the conditions admit of it. All rubbish and uncultivated areas should be cleaned up or burnt over to destroy favourable shelters. Where the beetles are present before 1st April, peas and soy beans should be used for forage. Beans should only be planted for an early crop, and all remnants of these early crops should be destroyed and the ground replanted with crops other than those furnishing food for this pest during the late autumn.

HINDS (W. E.). **Report of Entomologist.**—*33rd Ann. Rept. Alabama Agric. Expt. Sta., 1919–20, Auburn,* January 1921, pp. 22–25.

Investigations into the life-history of *Epilachna corrupta*, Muls. (Mexican bean beetle) [*R.A.E.*, A, ix, 33, 118] and the turnip web-worm are in progress.

The annual loss in maize, amounting to from £800,000 to £2,000,000 (at par), in Alabama due to the rice weevil [*Calandra oryzae*] and other pests of stored grain may be greatly reduced by careful seed selection and the adjustment of the time of planting, harvesting and storing. In the field, trap-crops of early maturing maize have proved successful provided that a variety is chosen that matures

two or three weeks earlier than the main crop. The ears from the trap-crop should be gathered with the husks within six weeks after the maize reaches the roasting ear stage.

A few naphthaline balls should be placed on the top of the stored grain (1 lb. per 20 sq. ft. of area). This does not affect the feeding value or germination of the grain.

HINDS (W. E.) & THOMAS (F. L.). **Report of the Entomologist.** [Local Experiment Work, 1920.]—*Alabama Agric. Expt. Sta., Auburn,* Circ. 44, February 1921, pp. 18–20.

The first generation of the grass worm (*Laphygma frugiperda*) was reported early in June. The first and second broods occurred chiefly on land that had been flooded in December 1919 and the early spring of 1920. The second generation, which was unexpectedly large, did severe damage to young maize in July, and a large amount of lead arsenate and calcium arsenate was used. The grass lands of the western section of Alabama suffered most from attacks by the third generation, but on the whole it was not so serious on maize. The fourth generation was largely reduced by parasitic enemies.

ESSARY (S. H.). *Lespedeza* **(Japan Clover): Enemies.**—*Tennessee Agric. Expt. Sta., Knoxville,* Bull. 123, April 1921, p. 19.

Japanese clover (*Lespedeza striata*), the cultivation of which in Tennessee is here described, is seldom attacked by insects, fungi or bacterial diseases. Grasshoppers cause only slight damage. The larva of the smoky crane fly (*Tipula infuscata*) is common in Madison County, but has only once been known to destroy a field of this clover.

MCDANIEL (E.). **Internal Parasites of Michigan Coccidae.**—*20th Ann. Rept. Michigan Acad. Sci., 1918, Ann Arbor,* 22nd November 1919, p. 140. [Received 30th May 1921.]

The parasites recorded are: *Coccophagus aspidiotiphagus,* Gir., *Coccidencyrtus ensifer,* How., *Physcus varicornis,* How., *Prospaltella fasciativentris,* Gir., and *Aphidencyrtus aspidioti,* Gir., infesting *Aspidiotus juglans-regiae*; *Aphidencyrtus aspidioti,* Gir., *Aphelinus diaspidis,* How., *A. fuscipennis,* How., *Coccidencyrtus ensifer,* How., *Physcus varicornis,* How., *Prospaltella perniciosi,* Tower, *Habrolepis zetterstedti,* Westw., *Chaetostricha* sp., *Elasmus* sp., and *Mymarilla* sp. infesting *Aspidiotus perniciosus*; *Aphidencyrtus aspidioti,* Gir., and *Aphelinus diaspidis,* How., infesting *Lepidosaphes ulmi* (*Mytilaspis pomorum*); and *Encyrtus bicolor,* How., infesting *Coccus* (*Lecanium*) *hesperidum.*

DAWKINS (C. G. E.). **Notes on an Attack of** *Pyrausta machoeralis* **on Teak in Zigon and Tharrawaddy Divisions in 1920.**—*Ind. Forester, Allahabad,* xlvii, no. 5, May 1921, pp. 209–213.

In August and September 1920 both mature and young teak trees were heavily attacked by *Pyrausta machoeralis* in the above districts, and crows (*Corvus macrorhynchus*) were found to be feeding on the larvae. Severe damage is caused if saplings are attacked when growth of the main shoot is active, because the leader is killed. Pure teak plantations suffer more heavily than mixed forests.

Owing to lack of detailed information no effective control measures have been found, but all infested plantations should be coppiced and burnt over.

In September pupation took place in fallen leaves, and the undergrowth was swarming with emerged moths, but in January 1921 no trace was found of living pupae, and it is probable that the last brood had not survived, either because it had been starved, or had been exterminated by other influences. Numerous pupae of parasitic flies were found among the cocoons.

Chermes cooleyi.—Forestry Commiss., London, Leaflet no. 2, April 1921, 3 pp., 1 fig.

Chermes cooleyi, Gill., which attacks Douglas fir and Sitka spruce in America, has now been introduced into Great Britain, where at present it has only been observed on Douglas fir [*R. A. E.*, A, viii, 423].

Nursery plants of this conifer can be cleared of this gall Aphid in autumn and winter by dipping them in a solution of 1 lb. soft soap and 1 gal. water. If dipped in bundles the plants should be loose enough to allow the liquid to reach individual needles. The solution should not touch the roots. The plants should then be suspended, roots uppermost, to drip for from one to five minutes. Even if only isolated plants in nursery beds are infested, the whole bed should be treated.

Lounsbury (C. P.). **Cyanide Gas Remedy for Scale Insects.**—*Jl. Dept. Agric. Union S. Africa, Pretoria,* ii, no. 5, May 1921, pp. 437–452, 12 figs.

The process of fumigating citrus trees with hydrocyanic acid gas as a remedy for red scale [*Chrysomphalus aurantii*] and other "hard" scale-insects is described. Details are given of the materials to be used, the kind of generating vessel that is suitable, and the best sort of cloth for covers. Improved methods of generating the gas, and the various kinds of poles and their adjustment are discussed, with illustrations. The proportions of the chemicals used in a charge should be 1 oz. by weight of 126–130 per cent. sodium cyanide and $1\frac{1}{4}$ oz. by measure of 94 per cent. (or higher) sulphuric acid to 2 oz. by measure of water. The basis for calculating dosage is explained and a standard dosage table is given.

Treatment should be carried out in the absence of sunlight, preferably at night. It should be stopped if the wind is strong enough to sway the covers or if the covers become too heavy with dew to handle. The covers are far more gas-tight in damp air than in very dry air or sunlight; this explains in part why trees are more injured on some nights than on others. Late summer and autumn are the best seasons for fumigation work, and heavy dosages should be used only at these times. The gas is said to do much injury to trees that have been sprayed with Bordeaux mixture within several months. Gas generated in the ordinary way acts best on the higher parts of the tree [*cf. R. A. E.*, A, vii, 228; viii, 29]. As scales on branches near the ground are the most likely to escape the gas, it is advisable to precede fumigation by trimming away any branches that rest on the ground or that would be pressed to the ground by the cover. When killed by fumigation, the scales remain on the tree in a dried condition until scraped off or removed by wind or rain.

NOTICES.

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THE REVIEW OF APPLIED ENTOMOLOGY

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The Pine Shoot Beetle (*Myelophilus piniperda*, **L.**) ; **the Lesser Pine Shoot Beetle** (*Myelophilus minor*, **Hart.**).—*Forestry Commiss. London,* Leaflet no. 3, April 1921, 8 pp., 4 figs.

A considerable amount of information concerning the pine shoot beetle (*Myelophilus piniperda*, L.), which is widely distributed throughout the British Isles, and the lesser pine shoot beetle (*M. minor*, Hart.), which is confined to central and northern Scotland, has already been noticed [*R.A.E.*, A, viii, 237, 378].

Where possible, it is recommended that Corsican pines should be substituted for Scots pines, as owing to their vigorous growth they more easily resist the attacks of these beetles.

Departmental Activities : Entomology.—*Jl. Dept. Agric. Union S. Africa, Pretoria,* ii, no. 5, May 1921, pp. 399–403.

The insects recorded as being troublesome during March include *Pachnoda impressa* (common fruit beetle), of which the life-history is recorded [*R.A.E.*, A, ix, 243], and the tobacco slug [*Lema bilineata*] [*R.A.E.*, A, ix, 186]. Experiments have proved that the latter can be economically controlled by spraying with lead arsenate. While the exact moment for spraying has not been determined, it seems best to spray as soon as the beetle makes its appearance. Two sprayings at an interval of three weeks, and three sprayings were tried ; neither succeeded in killing all the larvae, but the infestation was considerably lessened. It is important to spray the whole field and to destroy any food-plants of the beetle that grow in the vicinity of the tobacco. Lead arsenate powder 1 lb. to water 50 gals. has been found strong enough to kill the insects.

The infestation of *Locusta pardalina* recently recorded [*R.A.E.*, A, ix, 282, 331] has continued and spread ; remedial measures have been considerably handicapped by heavy rains, and it is feared that there will be severe infestations in the near future. Further infestations of the mystery army worm [*Laphygma exempta*] are recorded. Numbers of young caterpillars were observed on the outskirts of Pretoria in March, and almost mature ones were found at the end of the first week in April. Oviposition was observed on 4th April. The larvae of *Pyrameis cardui* considerably damaged spring-grown lupins in Pretoria, while those of *Cacyreus* (*Lycaena*) *palemon* feed upon geraniums, pelargoniums and ivy geraniums. Collection of the ovipositing butterflies and the removal of eggs and larvae are advised. The caterpillars of *Lampides baetica*, L., attack the pods of green beans and may at times become very troublesome. A native weevil [*Alcides arcuatus*, Boh.] attacks the stems of beans in Rhodesia, forming galls, in much the same way as *Alcides erythropterus*, Chev., attacks climbing beans in Pretoria.

Fuller (C.). **White Ant Notes.**—*Jl. Dept. Agric. Union S. Africa, Pretoria,* ii, no. 5, May 1921, pp. 462–466.

The various types of injury caused by termites in South Africa, where 21 distinct groups occur, each having from one to five representatives, are reviewed. Attacks on living trees are practically all due to the fungus-growing species, consisting of twelve species having their homes in subterranean cavities. Their natural food, however,

is dead grass, and their normal attacks upon trees are not serious, being limited to dead bark, decayed interiors and dead limbs. It is only when the normal food supply is removed that orchard or transplanted forest trees are attacked, or when the moisture necessary to their existence is unobtainable elsewhere. The occurrence of termites in wells and boreholes, which has been the cause of several complaints, has been found to be merely accidental. Those in a well were harvesters; those from a borehole were the fungus-growing species, *Termes badius*. In both cases the termites had been in search of moisture.

Downes (W.). **Entomology : Its Practical Value.**—*Agric. Jl. B.C. Dept. Agric., Victoria, B.C.*, vi, no. 3, May 1921, pp. 72–73 and 79.

The importance of entomological work and the results obtained in British Columbia by the identification and control of insects are described.

The annual losses in Canada of field crops caused by insect pests alone amount to £25,000,000 (at par). It is estimated that 10 per cent. of the entire crop of wheat in Victoria is lost owing to Hessian fly [*Mayetiola destructor*]. Grasshoppers have infested 500,000 acres in Manitoba, approximately 1,600,000 acres in Alberta and 358,000 acres in Saskatchewan, where crops to the value of £500,000 were saved by control measures.

Vegetables suffer from 15 to 20 per cent. average loss from insect ravages. Fruit crops, being permanent, suffer greater damage in proportion to their area. The worst fruit pest is the codling-moth [*Cydia pomonella*], which is capable of causing 10 to 25 per cent. loss even in sprayed orchards.

The forests of the country are more damaged by insect pests than by fire. This is largely due to the old methods of lumbering, and care should be taken to clear away all slash and refuse, which provide breeding grounds.

A list of the principal noxious insects of direct importance in British Columbia and of the methods adopted for controlling them is given.

The article ends by briefly describing the work of the various Canadian Entomological Societies, and emphasises the desirability of teaching some elementary entomology in schools, with an account of how this is done in British Columbia.

Division of Zoology and Entomology.—*28th Ann. Rept. 1917–18, Washington State Coll. Agric. Expt. Sta., Pullman*, Bull. 153, January 1919, pp. 34–38. [Received 31st May 1921.]

As a result of increased insect activity the cranberry industry in south-western Washington is being threatened, several crops having been already entirely ruined. The chief damage is done by *Rhopobota* (*Eudemis*) *vacciniana* (black-head fireworm), which, in contrast to its behaviour in the East, is mainly destructive to the fruit. The larvae are most abundant in the latter part of May; those of the second brood in the middle of August. Larvae of a partial third brood were observed in September. Tests with various sprays show that a spreader

such as soap or glue is necessary and that nicotine gave better results than arsenicals. As the over-wintering eggs and hatching larvae occur exclusively on the lower side of the leaves within a few inches of the ground, the best results were obtained with a horizontal spray.

A weevil, *Geoderces incomptus*, proved locally destructive. *Crambus hortuellus* (cranberry girdler) was widespread, but caused comparatively little damage.

For the control of San José scale [*Aspidiotus perniciosus*] lime-sulphur, 3° Bé., is usually efficient; scales that are resistant to this strength will be equally resistant to a greater concentration and should therefore be treated with a good grade heavy oil spray.

MELANDER (A. L.). **Division of Entomology and Zoology.**—*29th Ann. Rept. 1918–19, Washington State Coll. Agric. Expt. Sta., Pullman,* Bull. 155, March 1920, pp. 23–25. [Received 31st May 1921.]

The various investigations carried out in previous years have been continued, and the work planned for the future is briefly discussed.

OLSEN (C. E.). **Another European Leafhopper in North America.**—*Bull. Brooklyn Ent. Soc.*, xvi, no. 2, April 1921, pp. 33–37, 1 plate.

Some specimens of a leafhopper, believed to be *Eutettix osborni*, which has only been recorded from Texas and California, have been found on tamarisk (*Tamarix gallica*). Comparison with European examples, however, shows that *Eutettix osborni*, Ball, is in fact a synonym of *Euscelis* (*Athysanus*) *stactogalus*, Fieb. The leafhoppers in question had probably been introduced from Europe with their food-plant.

GAHAN (A. B.). U.S. Bur. Ent.—**Remarks on the Genus** *Pleurotropis*, **with Description of a Parasite of** *Trachelus tabidus* **Fabricius (Hymenoptera : Chalcidoidea).**—*Proc. Ent. Soc., Washington, D.C.*, xxiii, no. 5, May 1921, pp. 113–120, 2 figs.

Pleurotropis benefica, sp. n., here described, was reared from the sawfly, *Trachelus tabidus*, F. [*cf. R. A.E.*, A, viii, 348]. The characters, especially those of the antennae of the genus *Pleurotropis*, are discussed.

CIMATTI (V.). **I Nemici della Vite.** [Insect Enemies of the Vine.]—*Riv. Agric., Parma,* xxvi, no. 21, 27th May 1921, pp. 300–301.

This popular article deals with various insect pests of the vine, including mole-crickets [*Gryllotalpa gryllotalpa*], various Coccids, beetles such as *Otiorrhynchus, Rhynchites* and *Haltica ampelophaga*, and mites. The remedies advised are those commonly employed.

CONDIT (I. J.). **Caprifigs and Caprification.**—*California Univ. Agric. Expt. Sta., Berkeley,* Bull. 319, March 1920, pp. 341–375, 23 figs. [Received 1st June 1921.]

The caprification of figs, and the rôle played by *Blastophaga grossorum* during the process, are discussed [*cf. R. A.E.*, A, viii, 534; ix, 115].

BIOLETTI (F. T.). **Protection of Vineyards from** *Phylloxera*.—*California Univ. Agric. Expt. Sta., Berkeley,* Circ. 226, December 1920, 4 pp. [Received 1st June 1921.]

The protection of vineyards from *Phylloxera* by means of quarantine regulations and the use of resistant stock are discussed.

Essig (E. O.). **Control of the Brown Apricot Scale and the Italian Pear Scale on Deciduous Fruit Trees.**—*California Univ. Agric. Expt. Sta., Berkeley*, Circ. 224, December 1920, 11 pp., 5 figs. [Received 1st June 1921.]

In California *Eulecanium* (*Lecanium*) *corni*, Bch., is a general feeder, attacking practically all kinds of deciduous fruit trees, vines, and many ornamental and wild trees and shrubs. The chief food-plants of *Epidiaspis piricola*, Del Guer., are apple, prune, pear, plum, peach, currant and Christmas berry. Its chief natural enemy is a Coccinellid, *Chilocorus bivulverus*, Muls.; that of *E. corni* is a Hymenopterous parasite, *Comys fusca*, How.

The most effective sprays against these scales are distillate oil emulsions, crude oil emulsions, and miscible oils. The preparation and application of them is described for the use of growers who prefer using home-made insecticides to proprietary brands.

Essig (E. O.). **The Pear Thrips.**—*California Univ. Agric. Expt. Sta., Berkeley*, Circ. 223, November 1920, 9 pp., 3 figs. [Received 1st June 1921.]

The life-history of *Taeniothrips inconsequens*, Uzel, in California, has already been noticed [*R.A.E.*, A, iii, 461]. The remedial measures advocated are thorough autumn irrigation and the use of cover crops. The object of the latter is to destroy the insects by producing a cold soil unfavourable to their development. Should these methods not be applicable, deep autumn ploughing is suggested. A spray of 5 gals. miscible oil and 1 pt. Black Leaf 40, made up to 200 gals. with water, should be applied against the adults repeatedly until their numbers decrease. If the larvae become numerous, spraying should be carried out with the above formula modified to 3 gals. of miscible oil and $1\frac{1}{2}$ pts. Black Leaf 40. Experiments with dusts show that a 5 per cent. "Nico-dust" kills all exposed thrips; it is more efficient against the adults than the immature stages. The best time for applying it is during the heat of the day.

The natural enemies of this pest are *Triphleps tristicolor*, White, *Chrysopa californica*, Coq. (California green lace-wing), *Hemerobius californicus*, Banks, *H. pacificus*, Banks, *Hippodamia convergens*, Guér., Syrphid flies, etc.

Other thrips frequently associated with *T. inconsequens* are *Frankliniella tritici*, Fitch (wheat thrips), *Heliothrips fasciatus*, Perg. (bean thrips), *H. haemorrhoidalis*, Bch. (greenhouse thrips), and *Euthrips occidentalis*, Perg. (western thrips).

Webber (H. J.). **Annual Report of the Director.**—*California Univ. Agric. Expt. Sta., Berkeley*, 1919–20, pp. 13–125.

Sprays of crude oil emulsions, distillate oils and miscible oils for the control of *Eulecanium* (*Lecanium*) *corni*, Bch. (brown apricot scale) have proved efficient if used before the buds begin to open.

Epidiaspis piricola, Del Guer. (Italian pear scale) causes serious injury to old orchards, attacking chiefly prunes and apples. The insect hides under the rough bark or on moss and smooth bark. It reproduces in great numbers, and feeds on the growing bark. The above-mentioned sprays, especially crude oil emulsions, also control this pest, if the lichen is first removed from the trees by drenching the trunks and limbs

The periodical outbreaks of *Eutettix tenella*, Baker (beet leaf-hopper) are due to the migration of the adult insects in summer. The cultivated area of San Joaquin valley is free from this pest from November to April, and beets should be planted in December or January, so that the foliage covers the rows before the insect returns in April.

The total destruction of the sugar-beet industry in California is threatened by the curly top disease spread by this leafhopper, and it is urged that varieties of beets should be selected to obtain more vigorous and resistant strains under Californian conditions.

The results are given of a survey of the Santa Clara valley to locate waters containing calcium, magnesium and chlorine, these being undesirable for sprays and dips. A certain quantity of chlorine was found to render the use of such water dangerous in applying acid lead arsenate. Caustic soda is recommended to soften water rather than soda ash.

Crude oil emulsions proved more effective in controlling the winter egg of the brown mite, *Bryobia praetiosa* (*pratensis*), than distillate oils or lime-sulphur, though the latter checks fungi and the peach twig-borer [*Anarsia lineatella*] if applied before the buds open.

Kaolin dusting mixtures are effective, and more convenient for destroying thrips and certain Aphids than liquid applications, which cannot be used on wet soils.

Nematode pests thrive in warm countries, and *Heterodera radicicola* and *H. schachtii* cause serious damage to potatoes, tomatos, beets, peas, beans and other crops. Soils once infected are rarely freed from the pest, and gardens become worthless. Disinfection of fields by growing immune plants is difficult, as weeds continue to support the Nematodes, and trap crops and poisons have proved ineffectual. Wireworms also cause serious damage. Various species are found in different localities; little is known of their life-history, except in the case of *Limonius californicus* (sugar-beet wireworm), but no satisfactory method of control has been found.

CONDIT (I. J.). **The Kaki or Oriental Persimmon.**—*California Agric. Expt. Sta., Berkeley*, Bull. 316, December 1919, pp. 231–266, 20 figs. [Received 1st June 1921.]

In the course of this paper dealing with the cultivation of persimmon (*Diospyros*) in California, the following insect pests are noted as causing slight damage:—the barnacle scale [*Ceroplastes cirripediformis*], the white peach scale [*Aulacaspis pentagona*], the codling moth [*Cydia pomonella*], and *Schizura concinna* (red-humped caterpillar).

In 1919 trees imported from Japan were destroyed owing to being infested with the eggs of a cicada, Mantid eggs, *Pseudococcus* sp., and an Aegeriid moth, *Sannina uroceriformis*, Wlk.

Strict quarantine measures should be adopted to prevent importation of the following pests: *Kakivoria flavofasciata* from Japan, fruit-flies from New South Wales, and *Oncideres cingulata* (twig girdler), San José scale [*Aspidiotus perniciosus*] and the orange whitefly [*Dialeurodes citri*] from the Southern United States.

EHRHORN (E. M.). **Division of Plant Inspection.**—*Hawaiian Forester and Agriculturist, Honolulu,* xviii, no. 2, February 1921, pp. 39–41.

The pests intercepted during January 1921 included scale-insects and *Aleurodes* sp. on avocado pear from Florida, and fungus gnats [Mycetophilids] in ginger roots from Korea.

WAKEFIELD (E. M.). **Mosaic Disease of Plants.**—*West Indian Bull., Barbados,* xviii, no. 4, 11th April 1921, pp. 197–206.

The work of previous authors dealing with mosaic disease of plants and the methods of controlling the toxin causing it is here reviewed.

The insects recorded as transmitting the disease to healthy plants are: the beet leafhopper (*Euttetix tenella,* Baker), causing curly-top of sugar-beet [*R. A.E.,* A, v, 492; vi, 480, etc.]; Aphids infecting spinach [*loc. cit.* vi, 453]; and the corn aphis [*Aphis maidis*], which transmits the disease to sugar-cane [*loc. cit.,* viii, 370, 483, etc.].

BODKIN (G. E.). **Some Insect Pests of British Guiana.**—*Jl. Bd. Agric., Brit. Guiana, Georgetown,* xiv, no. 2, April 1921, pp. 132–139.

In this paper, read to the Imperial Entomological Conference in London, June 1920, the following pests of sugar-cane are dealt with:—*Castnia licus,* F. (giant moth borer), *Diatraea saccharalis,* F. (small moth borer), *D. canella,* Hamps., *Metamasius hemipterus* (weevil borer), *Pelamia* (*Remigia*) *repanda* and *Laphygma frugiperda.* Information on their life-history and the remedial measures against the mhas already been noticed [*R. A.E.,* A, ii, 30, 57; v, 148, etc.].

The chief pest of coconut palms is *Brassolis sophorae,* L. [*loc. cit.,* iv, 66], and they are also occasionally attacked in certain localities by a large species of locust.

The invasion of locusts which occurred in 1917 is briefly mentioned [*loc. cit.,* vi, 335].

Young rice plants are attacked by the larvae of *P. repanda,* and the mature plants by *D. saccharalis. Citrus,* especially limes, suffers from attacks of scale-insects.

LAING (F.). **On Various Genera of British Aphides (Homoptera).**—*Ent. Mthly. Mag., London,* 3rd Ser., no. 77–78, May–June 1921, pp. 118–127, 4 figs.

The Aphids dealt with are *Atheroides serrulatus,* Hal., *A. hirtellus,* Hal., on *Aira caespitosa, Sipha schoutedeni,* del Guer., *S. littoralis,* Wlk., on grass, *Thripsaphis cyperi,* Wlk., on rushes, *Saltusaphis insessa,* Wlk., *S. familiaris,* Wlk., *Aspidaphis adjuvans,* Wlk., on *Polygonum aviculare* and *Lycopsis arvensis, Brachycolus frequens,* Wlk., *Aphis bufo,* Wlk., and *Rhopalosiphum eriophori,* Wlk.

UVAROV (B. P.). **On the Native Country of the Common House Cricket** (*Gryllus domesticus,* **L.**), **with a Description of a new Variety.**—*Ent. Mthly. Mag., London,* 3rd Ser., no. 78, June 1921, pp. 138–140.

The deserts of S.W. Asia and N. Africa are considered to be the original home of the house-cricket, *Gryllus domesticus,* L. In Transcaucasia it has been observed out of doors in the summer and in houses in the winter. Individuals recently received from a house in Khartoum are described as *G. domesticus,* L., var. *meridionalis,* n.

Work connected with Insect and Fungus Pests and their Control.—*Rept. Agric. Dept. St. Kitts-Nevis, 1919–20, Barbados,* 1921, pp. 11–12 and 27. [Received 2nd June 1921.]

No serious outbreaks of insects occurred during the year under review on sugar-cane. The cotton worm [*Alabama argillacea*] was prevalent during the latter half of the year, but the damage was greatly reduced where poisons were at once applied.

Cotton stainers [*Dysdercus*] were less injurious than in previous years. In view of the benefit derived from the destruction of native food-plants of these bugs, it is hoped that the campaign will be continued.

Baker (C. F.). **A Contribution to Philippine and Malayan Technical Bibliography : Work Fundamental to Plant Pathology and Economic Entomology.**—*Philippine Agric., Los Baños,* viii, no. 1–2, August-September 1919, pp. 32–37. [Received 6th June 1921.]

This bibliography collates many of the articles published during 1913–1919 on Philippine and Malayan fungi and insects, all of which are wholly or in part based on the biological field results obtained during that time by the author.

Van Slogteren (E.). **De Toepassing van Warmte als Bestrijdingsmiddel van eenige Bloembollenziekten.**—*Weekblad voor Bloembollencult.,* 19th August 1919, 21 pp. (Abstract in *Zeitschr. Landw. Versuchsw. Deutschösterr., Vienna,* xxiii, no. 9–12, September–December 1920, p. 156.) [Received 2nd June 1921.]

An effective remedy against Nematodes infesting hyacinths and narcissi is exposure of the bulbs for at least 24 hours to a temperature of 113°–115° F. (45°–46° C.).

Wagner (—). **Die Bekämpfung der Blattläuse und des Kupferbrandes bei Hopfen.** [Measures against Aphids and Copperburn on Hops.]—*Mitt. Deutsch. Hopfenbrauvereins,* viii, 1920, pp. 35–66. (Abstract in *Zeitschr. Landw. Versuchsw. Deutschösterr., Vienna,* xxiii, no. 9–12, September–December 1920, p. 161.) [Received 2nd June 1921.]

Repeated sprayings of the lower surface of the leaves with a ½–1 per cent. solution of barium chloride are effective against Aphids infesting hops. The sprayed leaves must not be used for fodder. A solution of tobacco refuse is also effective. Against mites, either the latter solution or lime-sulphur spray may be used. The applications should be made in the morning or in the evening, not in bright sunshine.

Feytaud (J.). **Sur la Protection des Edifices contre les Termites.**—*Rev. Zool. Agric. & App., Bordeaux,* xx, no. 3–4, March–April 1921, pp. 17–23.

The prevention of attacks of termites on houses by the careful selection of materials to be used in building, as well as the various methods of eradicating already existing infestations, are reviewed. A successful experiment with chloropicrin as a remedial measure is recorded.

FEYTAUD (J.). **Pulvérisations de Printemps contre le Ver des Pommes.**—*Rev. Zool. Agric. & App., Bordeaux,* xx, no. 3–4, March–April 1921, pp. 24–25.

The method of preparing and applying sprays for the protection of fruit trees against *Cydia* (*Carpocapsa*) *pomonella*, L., is described. The insecticides advocated are mixtures of calcium sulphate or Bordeaux mixture and lead arsenate. Of the latter from 17 to 25 oz. are added to a Bordeaux mixture containing 1 per cent. copper-sulphate and 5 per cent. fine lime or 2·5 per cent. quicklime. The same amount of lead arsenate may be added to a solution of calcium sulphate corresponding to about a 5 per cent. solution of the following concentrated stock solution: 1 lb. of fat lime, 2 lb. of sulphur, and 1 gal. of water.

The first application should be made before flowering, the second immediately after, and the third about 15 to 20 days later.

First Annual Report, 1920, of the Cotton Research Board.—*Min. Agric. Egypt, Cairo,* 1921, 124 pp., 3 pls., 2 figs., 1 map. [Received 9th June 1921.]

The experimental work on cotton carried out in 1920 is described, and a similar programme for 1921 is outlined. The present situation with regard to the pink bollworm [*Platyedra gossypiella*] and the remedial measures undertaken are discussed [*R.A.E.*, A, ix, 316]. It is estimated that during 1920, 98 per cent. of the larvae were killed in Upper Egypt and about 97 per cent. in Lower Egypt as a result of treating the cotton by heat.

The outbreak of the new mealy-bug on *Hibiscus* [*loc. cit.* 317] is briefly recorded. A description of this pest is in preparation under the name *Pseudococcus* (*Dactylopius*) *hibisci*, Hall.

The investigations planned in 1921 will also include experiments with a view to ascertaining the rôle played by *Oxycarenus hyalinipennis* (cotton seed bug) in causing boll shedding and sterility of seeds.

A bibliography of the chief cotton pests of Egypt, arranged by species, and with annotated suggestions for future research, is appended.

BRITTAIN (W. H.). **Notes on the Life-history, Habits and Control of the Pea Moth** (*Laspeyresia nigricana*, **Steph.**).—*Proc. Ent. Soc. Nova Scotia, 1919, Truro,* no. 5, February 1920, pp. 11–20, 1 plate. [Received 9th June 1921.]

The life-history of *Cydia* (*Laspeyresia*) *nigricana*, Steph. (pea moth) has been worked out under Nova Scotia conditions, and apparently differs in essentials from that described by authors for other parts of the country [see, however, *R.A.E.*, A, ix, 100, 221].

Under artificial conditions the first moths were noticed on 12th July, and continued emerging until 7th August. In the field they probably appear a few days earlier. Eggs are laid from four to seven days after emergence, on the upper surface of the sepals, and never in any other situation. They are sometimes laid singly, or two side by side. More than two larvae have never been taken from one pod. The sepals of partly developed pods are generally chosen for oviposition, thus ensuring suitable food for the larvae.

Eggs hatched in the insectary in from two to three days, and even different climatic conditions would hardly account for the variation between these and the usual time given, *i.e.*, two weeks. The larvae

bore through the pod into the seed beneath, and when fully grown they pierce the side of the pod before the peas are ripe and descend to the ground. About 17 to 20 days are spent in the pods, and the larvae may be found in them from the middle of July to the middle of September. Hibernation occurs in the soil in the cocoon, in which the larval stage is continued until July or August of the following season.

Experiments made to control this pest by sprays and dusts have not proved successful. Calcium arsenate gave the best results as a spray, but until further experiments disclose some means of making the spray adhere more readily to the slippery pods, this method cannot be advocated.

Sanders (G. E.) & Kelsall (A.). **The Use of White Arsenic as an Insecticide in Bordeaux Mixture.**—*Proc. Ent. Soc. Nova Scotia, 1919, Truro*, no. 5, February 1920, pp. 21–33. [Received 9th June 1921.]

The information here given has already been noticed [*R. A. E.*, A, viii, 150].

Brittain (W. H.). **Experiments in the Control of the Cabbage Maggot** (*Chortophila brassicae*, **Bouché**).—*Proc. Ent. Soc. Nova Scotia, 1919, Truro*, no. 5, February 1920, pp. 41–66, 1 plate. [Received 9th June 1921.]

The life-history of *Phorbia* (*Chortophila*) *brassicae*, Bch., as occurring in Nova Scotia, is described. The experiments discussed in connection with remedial measures have already been noticed [*R. A. E.*, A, ix, 127].

Whitehead (W. E.). **Notes on the Life-history and Nymphal Stages of** *Entylia bactriana*, **Germar.**—*Proc. Ent. Soc. Nova Scotia, 1919, Truro*, no. 5, February 1920, pp. 67–72, 1 plate. [Received 9th June 1921.]

The Membracid, *Entylia bactriana*, Germ., has been causing considerable damage to annual sunflowers (*Helianthus annuus*) in Nova Scotia during recent years. This is apparently its only food-plant in Nova Scotia. The eggs are laid in irregular masses along the midrib on the lower surface of the leaf, causing it to curl. Oviposition occurs in the latter part of June and beginning of July. In 1919 the first eggs hatched on 12th July. The nymphs are very sluggish, and feed on the lower surface of the leaf throughout the five instars. The adults appear in about 30 to 40 days, and hibernation occurs in this stage. There is only one generation a year in Nova Scotia. According to Funkhouser [*R. A. E.*, A, vi, 222] there are two generations in New York, and the entire life-cycle may be spent on joe-pye (*Eupatorium purpureum*). This author's description of the adult stage is quoted.

Brittain (W. H.). **The Occurrence of the Apple Sucker** (*Psylla mali*, **Schmidb.**) **in Nova Scotia.**—*Proc. Ent. Soc. Nova Scotia, 1919, Truro*, no. 5, February 1920, pp. 73–76. [Received 9th June 1921.]

The various stages of *Psylla mali*, Schmidb., and the injury it causes are described. The remedial measures indicated have already been noticed [*R. A. E.*, A, vii, 506].

SANDERS (G. E.) & KELSALL (A.). **A further Report of the New Copper-Arsenic Dust.**—*Proc. Ent. Soc. Nova Scotia, 1919, Truro,* no. 5, February 1920, pp. 77–94.

This paper is an amplification of one already noticed [*R.A.E.*, A, vii, 303] and is published owing to the interest shown in the results obtained with copper-arsenic dust. Subsequent field results are described [*loc. cit.*, ix, 228].

SPIERENBURG (D.). **Een onbekende Ziekte in de Iepen.** [An unknown Disease of Elms.]—*Tijdschr. Plantenziekten, Wageningen,* xxvii, no. 5, May 1921, pp. 53–60, 1 plate.

An as yet undetermined disease is affecting elms in Holland. Branches from some of these have been found to harbour *Scolytus* (*Eccoptogaster*) *scolytus*, F., but infestation by this beetle seems to be secondary. *Typhlocyba* sp. was also commonly observed on the branches of affected trees.

It is advisable to cut off all dead branches and to smear the wounds with carbolineum. If the beetle infestation is not too severe, carbolineum of 30 per cent. strength should be brushed on the trunk and branches in May, when the beetles begin to fly. This prevents oviposition, and contact with this substance is said to kill the beetles.

Beukenwolluis (*Cryptococcus fagi,* **Dougl.**). [The Beech Scale.]—*Tijdschr. Plantenziekten, Wageningen,* xxvii, no. 5, May 1921, pp. 61–62.

The beech scale, *Cryptococcus fagi*, Dougl., hibernates in cracks of the bark. It attains maturity in April–July, all the individuals found being females. The eggs are laid from the beginning of June to the end of October. The incubation period varies with the temperature; in September–October from 45 to 50 days are required. Temperature also influences the mobility of the larvae. In the middle of a sunny day a larva is sometimes able to climb over 6 ft., so that it may reach the crown of a tree in a few days. The pest spreads during the period from June to November, wind being the chief distributing agent.

The injury done by this scale, which is slowly spreading in Holland, seems to be less important than was thought at one time; infestation has to be very severe before much damage is done.

Scrubbing with a 7½ per cent. solution of carbolineum will free the trees from infestation; this treatment may be repeated if necessary.

LINNANIEMI (W. M.). *Deltocephalus striatus,* **L.**—*Meddel. Soc. Flora et Fauna Fennica, 1918–1919; Helsingfors,* 1920, p. 2. (Abstract in *Wiener Landw. Ztg.*, 1921, no. 32–33.)

In 1918 a leaf-hopper, *Deltocephalus striatus*, L., appeared on wheat, rye and oats in south-west Finland and caused losses amounting to several million marks. No such outbreak has been previously recorded in Finland.

Forsius (R.). **Kleinere Mitteilungen über Tenthredinoiden.** [Minor Communications on Tenthredinids.]—*Meddel. Soc. Flora et Fauna Fennica, Helsingfors,* no. 45, 1920, pp. 165–169.

Forsius (R.). **Kleinere Beiträge zur Kenntnis der Tenthredinoideneier.** [Minor Contributions to the Knowledge of the Eggs of Tenthredinids.]—*Ibidem,* pp. 169–184, with figs. (Abstracts in *Wiener Landw. Ztg.,* 1921, no. 32–33.)

Many notes of galls on willows caused by sawflies are given.

The largest eggs are those of *Acantholyda pinivora,* a pest of pine. Those of *Lophyrus sertifer* and a few other species are able to withstand such low temperatures as — 30° C. (— 22° F.). Sexual reproduction is usual, but parthenogenesis may occur. The eggs are destroyed by Acarids, bugs, and parasitic Hymenoptera.

Forsius (R.). **Zur Kenntnis einiger Blattwespen und Blattwespenlarven.** [A Contribution to the Knowledge of some Sawflies and Sawfly Larvae.]—*Meddel. Soc. Flora et Fauna Fennica, Helsingfors,* no. 45, 1920, pp. 106–115. (Abstract in *Wiener Landw. Ztg.,* 1921, no. 32–33.)

In Finland many species of sawflies injure *Alnus, Betula* and *Salix.* The larvae of *Amauronematus forsius,* Ensl., often completely defoliate *Salix aurita. Lophyrus fuscipennis,* Fs., oviposits on the needles of *Picea excelsa.* The larva of *Pamphilius depressus,* Schr. (*vafer,* Zett.), eats holes in the leaves of *Betula verrucosa* and rolls them up. Two species attack *Geranium silvaticum,* and others injure *Rumex domesticus, Rosa* and *Spiraea. Calameuta filiformis,* Eversm., occurs on oats in Finland, never on reeds.

Muller (H. C.) & Molz (F.). **Weitere Versuche zur Bekämpfung der Rübennematoden** (*Heterodera schactii,* **A. Schmidt**) **mittels des abgeänderten Fangpflanzenverfahrens.** [Further Experiments in combating *H. schachtii* by means of the modified Trap Plant Method.]—*Landw. Jahrbücher,* liv, no. 5, pp. 747–768. (Abstract in *Wiener Landw. Ztg.,* 1921, no. 32–33.)

Trap plants for the Nematode, *Heterodera schachtii,* Schmidt, may be killed by a 30 per cent. solution of iron sulphate. The first trap crop must be sown before cereals, and two others after harvesting. After the iron sulphate has destroyed all the aerial parts of the plants, the Nematodes continue to develop for some time in the roots, but no eggs are produced.

Schmidt (H. W.). **Die Schnellkäfer. Biologische Beobachtungen an** *Agriotes lineatus,* **L.**—*Mitt. Deutsch. Landw. Ges.,* 1921, no. 1, pp. 9–10. (Abstract in *Wiener Landw. Ztg.,* 1921, no. 32–33.)

In one part of a potato field wireworms, *Agriotes lineatus,* L., did no damage, whereas severe injury was observed in another portion. The former had been previously planted with horse-radish, while vetches had been grown on the latter. To combat *A. lineatus* the ground must be ploughed repeatedly, and this operation must not be followed by crops with succulent roots or tubers, or by wheat. Mustard, horse-radish or woad are, however, suitable.

Grether (—). **Verfahren zur Bekämpfung der Reblauskrankheit unter Erhaltung des Weinstockes (Präventivverfahren).** [A preventive Method for combating *Phylloxera*.]—*Wein u. Rebe*, ii, no. 7, 1920, pp. 328–337. (Abstract in *Wiener Landw. Ztg.*, 1921, no. 32–33.)

The author recommends the use of a cake containing carbon bisulphide and compounds of carbon chloride and potassium cyanide. This preparation is placed in the ground, and the fumes are said to destroy *Phylloxera*, though the tender roots are temporarily more or less injured also, according to their distance from the chemical. This substance should be used for stocks suspected of being infested ; those known to be so must be destroyed.

Service and Regulatory Announcements. August–December 1920.—*U.S. Dept. Agric., Washington, D.C.*, Fed. Hortic. Bd., no. 69, 19th March 1921, pp. 113–150. [Received 10th June 1921.]

As a result of the continued inspections throughout 1920 in the regulated areas of Louisiana, only one of these was found to be infested with pink bollworm [*Platyedra gossypiella*]. This infestation is undoubtedly traceable to the seed received at local oil mills in the preceding year. The invaded fields are within a three-mile radius of these mills. Extensive clearing-up work was immediately instituted, and a non-cotton zone extending from 1½ to 2 miles beyond the furthest known infestations has been announced in addition to the present regulated zone round that point. The area will include 6,000 acres of cotton land and will cost the State upward of £15,000 in compensation to planters in 1921. The unfavourable climatic conditions of 1919 and 1920 together with previous control work have probably eradicated the pest over considerable areas of the Trinity Bay district, and given adequate Federal and State support, as well as thorough co-operation of the planters, there is every opportunity of complete extermination. There is urgent need for strengthening the Texas Pink Bollworm Act of 1920, and determination of the scope of Federal work for 1921 is not possible until the policy and support of the State officials and the State Legislature have been indicated.

Precautions are being taken with reference to the possibility of carrying infestation in cars, and the regulations relative to marking, inspection, cleaning and disinfection of such cars are quoted. For the fumigation of cars 2 oz. of sodium cyanide guaranteed to contain not less than 51 per cent. cyanogen, 3 oz. of sulphuric acid 66° Bé. or approximately 1·84 specific gravity, and 4 oz. of water are to be used for every 100 cu. ft. of space.

An appropriation of about £3,000, of which one-third is to be immediately available, has been asked for to complete the extermination of the date scale, *Parlatoria blanchardi*.

The regulations concerning the importation of fruits and vegetables from Cuba, the Bahamas, Jamaica, etc., owing to the prevalence in those countries of *Aleurocanthus woglumi*, Ashby (citrus black fly) have already been noticed [*R.A.E.*, A, ix, 357].

A list is given of the current quarantine and restrictive orders.

de la Barrera (L.). **El Arseniato de Calcio contra el Picudo del Algodonero.** [Calcium Arsenate against *Anthonomus grandis*, Boh.]—*Rev. Agríc., San Jacinto, D.F.*, v, no. 11, March 1921, pp. 770–774, 9 figs. [Received 10th June 1921.]

The information given in this article on the use of calcium arsenate against the cotton bollworm, *Anthonomus grandis*, Boh., is substantially the same as that in a paper already noticed [*R.A.E.*, A, viii, 74].

Partial Report of Inspection Work during Autumn of 1919 and Spring of 1920.—*Qtrly. Bull. Virginia State Crop Pest Commiss., Blacksburg*, ii, pt. 2, July 1920, 4 pp. [Received 10th June 1921.]

The following pests were intercepted in bulbs imported into Virginia during the autumn of 1919:—*Merodon equestris*, F. (narcissus fly); *Eumerus strigatus*, Fall. (lesser bulb fly); *Pyralis farinalis*, L.; *Laemophloeus pusillus*; *L. minutus*, Oliv.; *Tenebrio molitor*, L.; *Palorus depressus*, Sch.; *Silvanus bidentatus*, F.; *S. surinamensis*, L.; *Rhizoglyphus hyacinthi*, Boisd. (bulb mite); *R. rhizophagus*, Bks., and several undetermined species.

Reppert (R. R.). **Some Insects injurious to Alfalfa in Virginia.**—*Qtrly. Bull. Virginia State Crop Pest Commiss., Blacksburg*, ii, no. 4, January 1921, 16 pp., 4 figs.

During the summers of 1918 and 1919 an examination was made of lucerne fields in Virginia, and a brief account is given of the life-histories of, and general remedial measures advocated against, the following pests: *Macrobasis unicolor*, Kby. (blister beetle), *Plathypena scabra*, F. (green clover worm), *Hypera* (*Phytonomus*) *punctata*, F. (clover leaf weevil), *Sitona hispidula*, F. (clover root curculio), *S. flavescens*, All., *Agallia sanguinolenta*, *Cirphis* (*Heliophila*) *unipuncta*, *Laphygma frugiperda* (fall army worm), *Pyralis farinalis* (meal snout-moth), clover hay worm [*Hypsopygia costalis*], Aphids and grasshoppers.

Hansen (D.). **The Work of the Huntley Reclamation Project Experiment Farm in 1919. Sugar-Beet Root-Louse Control.**—*U.S. Dept. Agric., Washington, D.C.*, Dept. Circ. 147, January 1921, pp. 11–12, 1 table. [Received 10th June 1921.]

The yield, sugar-content and percentage of infestation of sugar-beet by the root-louse [*Pemphigus betae*, Doane] are shown in tabular form, as the result of continued irrigation experiments in 1919 [*R.A.E.*, A, ix, 177]. The results indicate that as the number of irrigations decreased, the percentage of infestation increased, with a corresponding fall in the sugar-content.

Campbell (R. E.). **Nicotine Sulphate in a Dust Carrier against Truck Crop Insects.**—*U.S. Dept. Agric., Washington, D.C.*, Dept. Circ. 154, 21st February 1921, 15 pp., 5 figs, 3 tables.

The use of nicotine sulphate in dust form having been successful in controlling *Chromaphis juglandicola*, Kalt. (walnut aphis) [*R.A.E.*, A, viii, 130], experiments were carried out with this insecticide against the following pests: *Aphis gossypii*, Glov. (melon aphis), *Brevicoryne* (*A.*) *brassicae*, L. (cabbage aphis), *Acyrthosiphon* (*Macrosiphum*) *pisi*, Kalt. (pea aphis), *Thrips tabaci* (onion thrips), *Diabrotica soror*, Lec.

(western twelve-spotted cucumber beetle) and *D. trivitatta*, Mannh. (western striped cucumber beetle) The process of manufacture, the type of dusting machine used, and the results of the experiments are described.

For the control of Aphids other than *Aphis juglandicola*, Kalt., a higher strength of nicotine sulphate than 2 per cent. is necessary, and for *Acyrthosiphon pisi*, Kalt., a 10 per cent. strength should be carefully applied, this Aphid being most resistant to nicotine.

The material used against the cucumber beetles was a 10 per cent. strength of nicotine sulphate (40 per cent.) in a carrier of kaolin and lime.

All experiments proved that insects are killed more effectively than by liquid sprays and at less cost. All dust used was from a week to several months old, except in the case of the pea aphis, for which it was freshly made and kept in an air-tight container. Combination with lead and sulphur kills other insects and certain noxious fungi. The action of the dust is similar to that of a nicotine sulphate spray, but more rapid. The only disadvantages are that its volatility causes loss of strength unless freshly manufactured and kept air-tight. It can only be combined with Bordeaux mixture when the latter is dry. The dust is sometimes disagreeable to the operators, especially if they are inexperienced.

Chittenden (F. H.). **The Beet Leaf-beetle and its Control.**—*U.S. Dept. Agric., Washington, D.C.*, Farmers' Bull. 1193, March 1921, 8 pp., 8 figs.

This bulletin on *Monoxia puncticollis* gives, in a popular form, information already noticed [*R. A.E.*, A, ix, 203].

Hopkins (A. D.). **The Southern Pine Beetle: A Menace to the Pine Timber of the Southern States.**—*U.S. Dept. Agric., Washington, D.C.*, Farmers' Bull. 1188, March 1921, 15 pp., 4 figs.

Dendroctonus frontalis, Zimm. (southern pine beetle) is the most destructive enemy of all pines in the Southern States. There are from three to five generations annually, the first beginning with eggs deposited by the beetles that attack the trees in spring and those of the overwintered broods. The generations always overlap, so that emergence and attacks are continuous during the period of activity. The beetle is on the wing from March to December in the southern section and from May to November in the northern. It attacks and kills all healthy trees, infesting the middle or upper portions of the trunk, in which it excavates long, winding burrows through the inner layers of the living bark. The eggs are deposited in these, and the larvae feed on the inner bark, mining into the outer bark to pupate. The winter is passed in the bark in all stages of development.

Investigations carried out in 1911 proved that patches of dying pines were a menace to healthy trees and led to far greater destruction of merchantable pines than any other factor. Evidence of the presence of the beetle is shown by the foliage fading to pale green, changing to yellowish and pale brown, with no trace of injury by fire. If all the foliage has fallen, or partly fallen, the beetles have emerged and the trees are no longer a danger to others. If the trees die between March and October, the beetles will leave them after the foliage has

begun to fade, but if they die between October and December the brood will remain until March or April.

When locating and marking infested trees for felling or treatment, only those with fading foliage or the first stage of the yellowish-red tops need be considered, and before cutting trees it should be remembered that a freshly attacked tree is indicated by pitch tubes on the trunk or reddish boring dust around the base. The lower bark of a tree killed by the beetle may be living. The tops change from pale green to greenish-brown during the pupal stage and to a reddish hue when the adults emerge, which, in warm months, is 30 to 40 days after attack. Trees attacked in November and December will fade either before the spring or in February to April.

The following details in the methods of control are essential if serious mistakes and ultimate failure are to be avoided. Infested bark from standing or felled trees should be removed and burnt. Infested portions of trunks should be placed in water. The wood of infested trees can be used for fuel or lumber before the beetles emerge. If the larger infested trees are destroyed, neither the tops nor branches need be burnt, or young saplings removed. Dead trees and the lower bark of trunks need not be treated if the beetles have emerged. It is dangerous to cut pine trees in the summer if beetles are killing trees in the neighbourhood. Remedial measures should be carried out between November and March, though in northern localities they may be extended to May.

Patterson (J. E.). **Life-history of *Recurvaria milleri*, the Lodge-pole Pine Needle-miner, in the Yosemite National Park, California.**—*Jl. Agric. Res., Washington, D.C.*, xxi, no. 3, 2nd May 1921, pp. 127–142, 4 figs., 2 plates, 4 tables.

Investigations are recorded that were carried out in the Yosemite National Park, California, during the summers of 1917, 1918 and 1919, on the serious epidemic of *Recurvaria milleri*, Busck (lodge-pole pine needle-miner), infesting *Pinus murrayana*. Other investigations undertaken before 1917 are briefly reviewed.

When the moth is prevalent, defoliation becomes marked, followed in later years by the death of the crowns and ends of the branches and the stunting of the growth of the trees. Trees on rocky, exposed sites, under unfavourable soil and moisture conditions, suffer more severely than those in meadows with abundant soil and moisture.

The length of the life-cycle is 25 months. Flight occurs every alternate year, and in the other years the brood passes the larval stage in the needles of the current year's growth. The eggs are deposited on and under the needle-sheaths and occasionally on the terminal shoots. The larvae hatch in August and September. They feed on the needles by boring in near the outer ends, working towards the bases. This habit accounts for the comparatively prolonged life of the attacked needles. In infested areas, over 7,000 ft., winter commences in October, and insect activity ceases till spring. The winter of the first season is passed in the needles of the current year's growth. In the following August and September the larvae can be seen migrating to new needles, and in October they pass the second winter dormant in the first attacked needles of the second season's growth. In the second spring they again become active and complete the mining of the needles, enter fresh ones of the same growth and prepare to pupate. During its life of 23 months a larva mines three

needles. The pupal stage lasts from June to August, and after the adults have emerged the needles begin to fall.

Epidemic infestations occur only within certain areas, and the damage in them is severe. Larval infestation has not been found below 7,000 ft. elevation, and rarely above 9,000 ft.

Hymenopterous parasites have been reared from prepupal larvae and have been identified as belonging to the following genera, the last four being represented by new species :—*Angitia, Scambus, Epiurus, Copidosoma, Elachertus, Apanteles, Aethecerus, Euteles,* and *Habrocytus,* as well as an unidentified Eulophid. A small bird has also been observed feeding on the adults during the flight period.

As these natural enemies are not sufficient to control the pest, artificial measures are recommended. A contact spray is the only practicable one, as this may reach the exposed eggs and larvae before the latter enter the tips of the needles. The felling of infested trees is not advisable except in rare cases where a few infested trees threaten a non-infested stand.

The author suggests that money spent on protecting this species of pine would be more advantageously used for cultivating other pines, since *P. murrayana* is not desirable for park purposes and is of little commercial value.

Chopard (L.). **Une Fourmi Exotique acclimatée dans le Midi de la France.**—*Rev. Hist. Nat. App., Paris,* Ière Partie, ii, no. 5, May 1921, pp. 140–144.

In view of the presence of *Iridomyrmex humilis,* Mayr (Argentine ant) in the south of France [*R.A.E.,* A, viii, 326 ; ix, 56], a brief description is given of its life-history and the damage it causes.

Maxson (A. C.). **Principal Insect Enemies of the Sugar Beet in the Territories served by the Great Western Sugar Company.**—*Denver, Col.,* Agric. Dept., Gt. Western Sugar Co, 1920, 157 pp., 30 figs., 9 plates. [Received 14th June 1921.]

This work comprises a full list of the insect pests of sugar-beet divided into root and leaf feeders ; these are dealt with in detail, and remedial measures for them are given. A key is given for determining insect injury, and a special chapter is devoted to the predaceous and parasitic insects of the pests concerned. The appendices include a useful list of the pests arranged under their popular names.

Macleod (W. A.). **Grasshopper Campaign, Saskatchewan.**—*Agric. Gaz. Canada, Ottawa,* viii, no. 3, May–June 1921, pp. 328–329.

Preparations are being made in Saskatchewan and Alberta against the possible outbreak of grasshoppers in 1921, and it is thought that the areas where the insects were reported for the first time in 1920 will suffer more than localities in which they have been prevalent for a longer period. The campaign of 1920 resulted in an enormous saving of crops, and the organisation is to be continued.

Sanders (G. E.). **Insect Enemies of the Potato and their Control.**—*Agric. Gaz. Canada, Ottawa,* viii, no. 3, May–June 1921, pp. 308–311.

Spraying is the main factor in determining the yield of potato crops, and results of experiments are given, proving it to be also the cheapest method.

Of the various poison sprays, Bordeaux mixture, white arsenic and hydrated lime are recommended, and directions as to their preparation and application are given. For the control of Aphids on potatoes 1 pt. Black-leaf 40 to 100 gals. of Bordeaux is recommended; for flea-beetles, Bordeaux mixture should be used alone.

A new dust has been successful in controlling potato beetles [*Leptinotarsa decemlineata*], but for blight it is somewhat inferior to a liquid spray. It is composed of 15 lb. dehydrated copper sulphate, 8 lb. calcium arsenate, and 87 lb. hydrated lime.

CAMUS (J. S.). **Rice in the Philippines.**—*Philippine Bur. Agric. Manila,* Bull. 37, 1921, 90 pp., 47 plates. [Received 15th June 1921.]

The portion of this bulletin dealing with rice pests has been contributed by Arsenio Goco. The insects dealt with are: *Leptocorisa acuta,* Thunb. (rice bug), *Schoenobius incertellus,* Wlk. (*punctellus,* Z.) (rice stem borer), *Melanitis ismene,* Cram., *Cnaphalocrocis medinalis,* Gn., the cutworms *Prodenia litura,* F., and *Spodoptera mauritia,* Boisd., and locusts. The remedial measures adopted against these pests are briefly described.

WATERSTON (J.). **On some Bornean Fig-insects (Agaonidae—Hymenoptera, Chalcidoidea).**—*Bull. Ent. Res., London,* xii, pt. 1, June 1921, pp. 35–40, 3 figs.

Notes are given on a small collection of fig-insects from Sarawak, the new species described being *Ceratosolen hewitti* and *Eupristina verticillata.*

HILL (G. F.). **The Life-history of** *Euthyrrhinus meditabundus,* **Fabr., an important Weevil Pest of Mango Trees in Australia.**—*Bull. Ent. Res., London,* xii, pt. 1, June 1921, pp. 63–66, 1 plate, 1 fig.

Mango trees in North Queensland are attacked and often killed by a weevil, *Euthyrrhinus meditabundus.* The eggs are laid in September in a hole in the bark made by the adult with its proboscis. The young larvae tunnel into the bark; a few shallow grooves are sometimes made in the sapwood, and a gallery is then bored horizontally towards the heartwood. The terminal twigs wither and the branches ultimately die. As a rule the injury caused by the larvae is such that the branch is destroyed before the first beetles emerge. Pupation takes place near the cambium, and the beetles have been observed to emerge from April to the end of August. Beetles that emerged from a dead tree migrated at once, those from a partly dead one gathered on, and oviposited in, the remaining living portion.

While the young larvae are near the surface of the wood they are often parasitised by the Chalcids, *Chalcis euthyrrhini* [see below], *Thaumasura curculionis,* Gir., and *T. pavo,* Gir. Two Hymenopterous egg-parasites also occur, and a Braconid has often been taken on the infested branches.

These parasites do not, however, control *E. meditabundus,* and artificial means must be resorted to. The only recommendation that can be made at present is that badly infested trees should be cut down and burnt before the adult weevils leave them, for it is evident that they cannot be saved once the main branches and trunk are heavily infested.

DODD (A. P.). **A New Chalcid Parasite of** *Euthyrrhinus meditabundus.* —*Bull. Ent. Res., London,* xii, pt. 1, June 1921, pp. 67–68.

Chalcis euthyrrhini, sp. n., bred from *Euthyrrhinus meditabundus* in North Queensland [see above], is here described. The host record is of interest, as the other members of the genus attack Lepidopterous and Dipterous larvae.

DAVIDSON (J.). **Biological Studies of** *Aphis rumicis,* **Linn.**—*Bull. Ent. Res., London,* xii, pt. 1, June 1921, pt. 81–89, 6 figs.

Aphis rumicis, L., has many synonyms, owing to its polyphagous habits. A detailed, illustrated description is here given of all the forms of this Aphid. The account of its life-history is based on extensive experiments and observations in the field carried on in 1913, 1914 [*cf. R. A.E.,* A, ii, 660] and 1920.

The ova hatch in March and April on the winter food-plant (*Euonymus* and probably other genera) and give rise to the fundatrices. These produce parthenogenetic viviparous females, either winged or wingless, or the latter only. They give rise to similar generations, but there is a tendency for the wingless ones to produce a majority of winged individuals. The latter migrate to the intermediate or summer food-plant, and eventually the winter food-plant becomes free from the Aphid. On the summer plants, of which beans are specially favoured, the tendency is for the winged females to produce wingless individuals, and for these to produce similar offspring or a mixed progeny with a varying percentage of winged examples. The liability to overcrowding as the plant becomes heavily infested is thus overcome, and the wider distribution of the species to other plants ensured.

Towards the end of summer winged viviparous females are produced that are physiologically specialised. These fly back to the winter host and produce sexual oviparous females. About the same time winged males are produced from wingless sexuparae on the summer food-plant and fly to the winter one, where the sexual females are fertilised. Eggs are then laid on the winter host, and give rise to the fundatrices in the following spring.

The remaining wingless forms on the intermediate host gradually die out, owing partly to the tendency to produce winged forms, and partly to unfavourable conditions. Probably during a mild winter agamic forms may survive on certain plants and carry on normal asexual reproduction in the following year. Experimentally a parthenogenetic strain was continued throughout the winter in a greenhouse, winged sexuparae, males, and parthenogenetic wingless females being produced in each generation from September to May. Further, it seems evident from experiments that in the adventures of migration the winged forms of any parthenogenetic generation may alight on the winter food-plant and produce young, resulting eventually in colonies consisting of all stages. Similarly, winged sexuparae alighting on intermediate food-plants may give rise to sexual females, which it is thus possible to find in association both with agamic forms and males.

DRY (F. W.). **Flax Caterpillars in Kenya Colony, with special reference to the Limitations of the Roping Method of combating them.**—*Bull. Ent. Res., London,* xii, pt. 1, June 1921, pp. 99–102.

Caterpillars on flax are serious pests in Kenya Colony. They belong to more than one species, the most common being *Phytometra orichalcea*, F.; *Heliothis obsoleta*, F., is also met with. They have a wide range of food-plants, including beans, potatoes and rape. Serious damage to flax was reported in 1918, 1919 and particularly 1920. In its early stages the crop may be completely consumed. In the later stages the seed-bolls are especially attacked. When the caterpillars are less numerous, the growing point of the plant is often damaged at the apex. Most of the damage is done from May to August, following the long rains, but outbreaks have occurred after the short rains, which are due from October to December. The life-cycle of *P. orichalcea* occupies about 12 weeks. Eggs are laid two days after the emergence of the moths and hatch in about 10 days. Forty-one days are spent as a larva and 30 days in the cocoon.

Eight species of parasites, both Hymenopterous and Dipterous, have been reared from this moth.

Spraying is not very effective, though in one case some success was obtained with strong Paris green against small caterpillars. Control by means of roping [*R. A. E.*, A, viii, 432] has been attempted by several flax-growers, but accounts of the success obtained were conflicting, and a number of experiments were undertaken to test the efficacy of this method. The conditions involved in success or failure seemed to be the kind of rope, the frequency of roping and the size and number of the caterpillars. A heavy rope has more effect than a light one. On small caterpillars the effect is both direct, by injury, and indirect, by placing them at the mercy of ants. On large ones there is little effect by either means. If the caterpillars are very numerous, roping would probably have to be done more often than is feasible. Very little success has been reported against bad outbreaks, and it appears that roping produces its effect by bringing about the death of only a small percentage of caterpillars each time the rope passes. Thus, though roping will be successful in favourable circumstances, it will probably be replaced by something more effective in the future.

DRY (F. W.). **The Red Scale,** *Chrysomphalus aurantii*, **Mask., in Kenya Colony.**—*Bull. Ent. Res., London,* xii, pt. 1, June 1921, pp. 103–104.

The eradication of *Chrysomphalus aurantii*, Mask. (red scale) in Kenya Colony has proved impracticable. The life-cycle occupies a total of 120 days; larvae placed on plants in November moulted for the first time after 18 days, the females moulted again after 50 days, the first males emerged on the 65th day, and the first larvae of the next generation were observed after 110 days. The average daily temperatures during this time showed a minimum of 54·5° F. and a maximum of 80·5° F. Contrary to expectation, coffee appears to be immune to the attacks of this scale, but, besides *Citrus*, it has been found on rose, apple, plum and sisal.

Selenaspidus articulatus, Morg. (West Indian red scale) has frequently been mistaken for *C. aurantii*. It occurs both on *Citrus* and coffee, but is apparently not of any great economic importance.

SANDERSON (E. D.) & PEAIRS (L. M.). **Insect Pests of Farm, Garden and Orchard.**—*New York*, John Wiley & Sons, Inc.; and *London*, Chapman & Hall, Ltd., 1921, 2nd Edn., vi + 707 pp., 604 figs. Price 26*s*.

The present volume is the result of the junior author's revision of the original work by Sanderson, and collates the results, more especially those relating to methods of control, yielded by entomological investigation since the work was first issued in 1912. The main additions are three chapters dealing with the insects directly attacking man and domestic animals and with those injurious to citrus fruits.

The discussions of life-histories, habits, and control are based upon conditions east of the Rocky Mountains, practically no consideration being given to the conditions of the Pacific Coast or to those of the irrigated country of the Far West. The illustrations adequately meet the needs of such a work of general reference, and the volume must rank as one of the standard works on applied entomology.

COLCORD (M.). **Index II to the Literature of American Economic Entomology, 1915 to 1919.**—*Melrose Highlands, Mass.*, Amer. Assoc. Econ. Ent., 1921, vi + 388 pp. Price $6.50.

This serviceable work, edited by Dr. E. P. Felt, is a continuation of Bank's Index, 1905 to 1914, which was a modified extension of the Bibliography of American Economic Entomology, issued by the U.S. Department of Agriculture, by Henshaw (parts i–v) and Banks (vi–viii).

The scope of the work is limited to temperate and subtropical America. The insects and other headings are arranged alphabetically, the references being by authors alphabetically and those by each author chronologically.

A Program for the Treatment of Orchard Insect Pests and Plant Diseases.—*8th Ann. Rept. Ind. State Ent., Indianapolis,* 1916, pp. 91–190, 78 figs. [Received 14th June 1921.]

The general information contained in this bulletin with regard to orchard pests and their control is listed under the crops attacked. Spray calendars are given for all the important fruits and for some vegetables, with formulae for the various insecticides and fungicides required.

DIETZ (H. F.) & MORRISON (H.). **The Coccidae or Scale Insects of Indiana.**—*8th Ann. Rept. Ind. State Ent., Indianapolis,* April 1916, pp. 195–321, 96 figs. [Received 14th June 1921.]

The Coccids in Indiana are represented by 62 species. Keys to the subfamilies, genera and species are given as well as a special field key to the species, based on superficial characters.

Those recorded as injurious to trees and plants out of doors are *Phenacoccus acericola* (woolly maple leaf scale), *Pulvinaria vitis* (cottony maple scale), *Eulecanium* (*Lecanium*) *corni*, *Toumeyella liriodendri* (yellow poplar scale), *Chionaspis americana*, *C. furfura* (scurfy scale), *C. pinifoliae* (pine scale), *C. salicis-nigrae*, *Aulacaspis rosae* (rose scale), *Aspidiotus ancylus* (Putnam scale), *A. perniciosus* (San José scale), *A. uvae* (grape scale), *Chrysomphalus obscurus* (obscure scale), and *Lepidosaphes ulmi* (oyster-shell scale).

Species particularly injurious to greenhouse plants are *Eriococcus azaleae* (azalea bark louse), *Pseudococcus adonidum* (long-tailed mealy-bug), *P. citri* (short-tailed mealy-bug), *Coccus hesperidum* (soft scale), *Saissetia hemisphaerica* (hemispherical scale), *S. oleae* (black scale), *Diaspis boisduvali, Hemichionaspis aspidistrae, Aspidiotus hederae* (oleander scale), *A. rapax* (greedy scale), *A. britannicus, Chrysomphalus aonidum* (circular scale) and *C. dictyospermi.*

Although *Gossyparia spuria* (European elm scale), *Eulecanium* (*Lecanium*) *nigrofasciatum* (terrapin scale), *Aspidiotus forbesi* (cherry scale) and *A. juglans-regiae* (English walnut scale) are known to occur in Indiana, they have not yet been recorded as of economic importance.

Various remedial measures, such as fumigation and spraying, are briefly discussed, both for use against the species found in the field and in greenhouses.

EHRHORN (E. M.). **Report of the Chief Plant Inspector.**—*Bienn. Rept., 1919–20, Hawaii Bd. Agric. & Forestry, Honolulu,* 1921, pp. 75–113, 7 plates. [Received 14th June 1921.]

An account is given of the plant inspection work during the period under review, with a list of the existing quarantine notices and restrictive orders.

A list is given of the pests occurring in other countries, the introduction of which into the Territory of Hawaii must be guarded against.

FULLAWAY (D. T.). **Report of Entomologist.**—*Bienn. Rept., 1919–20, Hawaii Bd. Agric. & Forestry, Honolulu,* 1921, pp. 69–73, 3 plates. [Received 14th June 1921.]

The work carried out during the period under review is discussed [*cf. R.A.E.*, A, viii, 375]. In September 1920, steps were taken to investigate the biology of *Syagrius fulvitarsis* (Australian fern weevil) with special reference to its natural enemies in Australia. Arrangements have been made to co-operate with the Hawaiian Sugar Planters' Association Experiment Station in introducing parasites of the butterfly, *Lampides* (*Lycaena*) *baetica* (bean pod borer), and insects producing fertile seeds of *Ficus* spp.

The establishment of the cockroach parasite, *Dolichurus stantoni*, is recorded [*loc. cit.* vii, 412], and a further attempt to acclimatise *Pteromalus puparum*, an important pupal parasite of *Pieris rapae*, was made.

Un nuevo y muy eficaz Insecticida. La Cloropicrina. [A new and highly efficient Insecticide, Chloropicrin.]—*Bol. Agric., Ind. y Com., Guatemala,* i, no. 1, January 1921, pp. 25–26. [Received 14th June 1921.]

The data here given on chloropicrin as an insecticide are taken from a source already noticed [*R. A.E.*, A, vi, 491].

Valor relativo de los Insecticidas y Fungicidas. [The Relative Value of Chemicals used against Insects or Fungi.]—*Bol. Agric., Ind. y Com., Guatemala,* i, no. 1, January 1921, p. 27. [Received 14th June 1921.]

In preparing Bordeaux mixture it must be remembered that 1 lb. of the metallic copper equals 3·93 lb. of copper sulphate, 3·14 of copper oxide, and 2·56 of copper hydroxide ($Cu(CH)_2$). This will enable a

correct estimate to be made of the costs at current prices. Bordeaux mixture is, of course, essentially a fungicide, but the addition of asphyxiating, corrosive, or poisonous substances enables it to be used against insect pests.

Lavergne (G.). **Les Cochenilles des Arbres Fruitiers.**—*Jl. Agric. Pratique, Paris*, xxxv, no. 23, 11th June 1921, pp. 454–455, 1 plate.

Attention is drawn to the damage caused to fruit trees by Coccids. Special reference is made to *Lepidosaphis beckii* (*Mytilaspis citricola*) on oranges and *L. ulmi* (*M. pomorum*) on pears. In the case of the latter scale Vayssière's description and account of the life-history are quoted [*R. A. E.*, A, i, 167].

Froument (R.). **Moyens de Lutte contre l'Eudémis.**—*Le Progrès Agric. et Vitic., Montpellier*, lxxv, no. 24, 12th June 1921, pp. 566–573.

The methods adopted in America for combating *Polychrosis* on vines are discussed [*R. A. E.*, A, v, 508 ; viii, 403 ; ix, 311]. In view of the legal restrictions concerning the use of insoluble arsenate, these measures cannot be applied in France, and the author insists that *P. botrana* will continue to be a pest until the judicious use of arsenates is permitted and they are generally employed.

Riehm (E.). **Prüfung von Pflanzenschutzmitteln.** [An Examination of Preparations for protecting Plants.]—*Mitt. Biol. Reichsanst. Land- u. Forstw., Berlin*, no. 19, December 1920, 34 pp. [Received 15th June 1921.]

This paper summarises the results published in 1919, mainly in Germany, on insecticides and fungicides. The substances are listed alphabetically, and in each case the reference to the original paper is given.

Moreira (C.). **Os Insectos damninhos. xv. O Bicho da Fructa de Conde,** *Anteotricha anonella*, **Sepp.** [Injurious Insects. xv. The Soursop Caterpillar, *A. anonella*.]—*Chacaras e Quintaes, S. Paulo*, xxiii, no. 5, 15th May 1921, pp. 365–366, 1 fig.

The principal pest of *Anona muricata* (soursop) in Brazil is the caterpillar of *Anteotricha anonella*, Sepp. This moth chiefly appears from July to September. The female lays at least 50 eggs on the fruits, which wither and fall as a result of the caterpillars feeding on the pulp. If only a few caterpillars infest a fruit of large size, it may ripen on the tree. The larval stage is believed to last about 20 days. The pupal stage, which also occurs in the fruit, occupies 12. In one instance 30 adults were seen to emerge from a single fruit.

All fallen and infested fruits must be collected and burned. If high prices are obtainable and the fruits are of a large size, they may be enclosed in bags. Light traps will account for many adults.

Dash (J. S.). **Insectes et Maladies.**—*Second Rapport Sta. Agron. Guadeloupe, 1919–20, Pointe-à-Pitre,* 1921, pp. 21–22.

The moth-borer, *Diatraea saccharalis,* F., is the chief insect pest of sugar-cane in Guadeloupe. In one locality the foliage of young seedling cane was much injured by an Aphid, *Sipha flava,* Forbes.

The following cane weevils appear to exist in the island : *Diaprepes abbreviatus* L. ; *D. abbreviatus* var. *marginatus,* Oliv. ; *D. abbreviatus* var. *distinguendus,* Gyl. ; a form of *D. abbreviatus,* intermediate between var. *marginatus* and var. *distinguendus* ; and *D. famelicus,* Oliv.

Reports on the State of the Crops in each Province of Spain on the 20th May 1921.—*Bol. Agric. Téc. Econ., Madrid,* xiii, no. 149, 31st May 1921, pp. 437–454.

Haltica ampelophaga has injured vines in some areas. In Malaga wheat was attacked by *Thrips cerealium, Cephus pygmaeus,* and *Anisoplia segetum.*

Faes (H.). **Les Traitements contre le Ver de la Vigne (Cochylis) en 1920.**—*La Terre Vaudoise, Lausanne,* xiii, no. 23, 4th June 1921, pp. 255–258.

Numerous vineyard tests have shown the efficiency of nicotine or pyrethrum-soap sprays against the vine moth, *Clysia ambiguella,* Hb

Nicotine, added to a copper spray, gives the best result if the application is made at a time when the largest number of eggs can be reached. This implies some biological knowledge and great watchfulness. Pyrethrum-soap solution is applied when the caterpillars are 2–5 mm. long, and it is thus easier to choose the most favourable date for using this insecticide. Most excellent results were obtained with it in 1920, and pyrethrum is now being largely grown. The viticultural station at Lausanne distributes seed and seedlings ; requests for them have also been received from abroad.

Faes (H.). **La Tipule des Jardins.**—*La Terre Vaudoise, Lausanne,* xiii, no. 24, 11th June 1921, pp. 267–269, 1 fig.

The very dry winter of 1920–1921 favoured the development of many insect larvae, including those of *Tipula oleracea,* which have caused serious loss in many gardens.

The remedies advocated are the use of kainit, rolling with a heavy roller, or fumigation with carbon bisulphide poured into holes 6 in. deep, though where plants are already growing, the latter method is the only one available.

Smyth (E. G.). **Annual Report, Division of Entomology.**—*Ann. Rept., Porto Rico Insular Expt. Sta. 1919–20, Río Piedras,* 1920, pp. 83–89. [Received 21st June 1921.]

The work in connection with insects as transmitters of mosaic disease of sugar-cane has been continued [*R.A.E.,* A, viii, 483]. The inauguration of a special plant quarantine service is discussed, and the recent regulations issued against cotton from Porto Rico owing to the occurrence of *Eriophyes gossypii* (cotton-leaf blister mite) are recorded [*op. cit.,* ix, 313].

MORE (J. D.). **La Vaquita o Piche de la Batata.** [The Sweet Potato Weevil, *Cylas formicarius.*]—*Porto Rico Insular Expt. Sta., Río Piedras,* Circ. 34, January 1921, 6 pp., 1 plate. [Received 21st June 1921.]

No new information is given in this circular on the sweet potato weevil, *Cylas formicarius,* and the measures to be taken against it.

GONZÁLEZ RÍOS (P.). **El Cultivo del Cocotero en Puerto Rico.** [Coconut Cultivation in Porto Rico.]—*Porto Rico Insular Expt. Sta., Río Piedras, P.R.,* Circ. 35, February 1921, 20 pp., 4 figs. [Received 21st June 1921.]

The insect enemies of the coconut in Porto Rico are of little importance. They include the scales, *Aspidiotus destructor* and *Vinsonia stellifera,* which may be combated with a kerosene-soap spray, and a beetle, *Strategus quadrifoveatus,* which may be collected or killed on or in the palms, care being taken to keep the plantations clear of dead stems or other refuse.

CRIDDLE (N.). **Birds in Relation to Insect Control.**—*Canadian Field Nat., Ottawa,* xxxv, pt. 8, November 1920, pp. 151–153.

The value of birds as destroyers of noxious insects is discussed. Although parasites may be considered of most value in controlling serious insect outbreaks, birds, by destroying the surplus under normal conditions, may actually prevent serious infestations.

BALLOU (H. A.). **Pink Bollworm Notes.**—*Agric. News, Barbados,* xx, no. 496, 30th April 1921, p. 138.

The pink bollworm [*Platyedra gossypiella*], which has recently been spreading over the West Indian Islands [*R.A.E.*, A, ix, 99], has now been reported from Anguilla. In future, okra (*Hibiscus esculentus*) will have to be controlled by the same regulations as to a close season that apply to cotton. While all varieties of cotton are attacked, okra and Indian hemp (*H. cannabinus*) are food-plants in India, and okra is reported to be attacked in Mexico, but is not affected in Hawaii and Texas, where cotton seems to be the only suitable food-plant. As yet, Montserrat is the only West Indian Island where okra has been observed to be attacked, but the same thing will probably be found to occur in the other islands. There is a great danger that, with the reduction in planting consequent upon the present low price of cotton, cultivation may be abandoned on some areas, and the land left uncleared of the old cotton plants. This will be a serious problem for inspectors to deal with. The necessity is pointed out of registering every plot of cotton grown in each island, and during the cotton season each of these should be visited, and all patches of wild cotton located and destroyed. Every plant growing beside labourers' houses should likewise be marked and destroyed or cut down before the close season.

In spite of the fact that *P. gossypiella* is capable of reducing the yield of cotton by 70 or 80 per cent., it is considered possible to control it sufficiently for satisfactory crops to be obtained.

SEVERIN (H. H. P.). **Practical Use of Curly Leaf Symptoms.**—*Facts about Sugar, New York,* xii, nos. 9 and 11, 26th February & 12th March 1921, pp. 170–171, 173, and 212–214, 217, 25 figs.

The symptoms of curly leaf disease of beet conveyed by *Eutettix tenella* are discussed and compared with cases of abnormal beet foliage and insect injury such as is caused by *Empoasca viridescens.* The most constant and reliable symptom is a transparent network of minute veins, generally occurring on the youngest leaves.

During an outbreak of the disease in 1918–19 observations were made in California on such conditions as environmental factors and the effects of drought. During this outbreak the percentage of curly leaf was not in proportion to the leaf-hoppers present, the condition being attributed to the shortage of rainfall.

The beet leaf-hopper, *Eutettix tenella,* was also taken on *Atriplex expansa* and *A. rosea* [*cf. R.A.E.,* A. vii, 474].

PETTIT (R. H.). **The European Corn Borer.**—*Michigan Agric. Expt. Sta., East Lansing,* Circ. Bull. 44, November 1920, 3 pp., 4 figs. [Received 21st June 1921.]

To prevent the establishment of the European corn borer [*Pyrausta nubilalis,* Hb.] in Michigan all suspected occurrences of the pest should be at once reported. The effects of the borer on various parts of the maize plant are illustrated.

Prorogation de l'Emploi des Sels arsenicaux dans la Vigne. (Décision ministérielle du 27 avril 1921.)—*Rev. Agric. Afr. Nord., Algiers,* xix, no. 98, 17th June 1921, pp. 461–462.

The use of soluble arsenical salts for protecting fruit trees and vines is permitted from the end of the vintage season of 1921 up to the beginning of the vegetative period in 1922. Such arsenicals may be delivered and used only if dyed a blue colour according to the following formula: soluble arsenicals 1,000 gms., pure diamin blue 3 gms.

JEGEN (G.). **Die Blutlaus.** [The Woolly Aphis, *Eriosoma lanigerum.*]—*Schweiz. Zeitschr. Obst- u. Weinbau, Frauenfeld,* xxx, no. 12, 18th June 1921, pp. 182–185.

General measures against *Eriosoma lanigerum* comprise the selection for given localities of those varieties of apple that are found to be free from infestation there, and the proper nourishment of the trees, especially of young ones.

Combative measures include a summer treatment, consisting in spraying the trunk and branches with a 2½ per cent. solution of soft-soap, beginning as soon as patches of the Aphid appear, and a winter treatment—the more important one—in which spraying is done with a 7 per cent. solution of soft-soap, applied freely, so that the drippings may soak the ground around the trunk.

PICARD (F.). **Sur deux Scolytides des Arbres fruitiers et leurs Parasites.**—*Bull. Soc. Path. Vég. France, Paris,* viii, no. 1, January-March 1921, pp. 15–20. [Received 22nd June 1921.]

In the south of France fruit trees are attacked by several Scolytid beetles, including *Scolytus rugulosus,* Ratz., *S. amygdali,* Guér., *Xyleborus dispar,* F., and *X. xylographus,* Say (*saxeseni,* Ratz.).

The author has never noticed *S. pruni*, Ratz., though it is common in the north of France. *S. rugulosus*, which has two annual generations in the south, is the dominant species, while *S. amygdali*, which is very similar in habits and injury, has hitherto been little noticed in France.

The last two species have numerous enemies, including a Clerid beetle, *Opilo domesticus*, Strm. There are also two Braconid parasites, *Dendrosoter protuberans*, Nees, and *Ecphylus eccoptogastri*, Ratz.; the latter is an ectoparasite of the second generation larvae and hibernates in the larval stage. The chief Chalcid parasites are *Eurytoma* sp. (which passes the winter in the mine of its victim), *Cheiropachys colon*, L., and *Raphitelus maculatus*, Wlk., which is less abundant than the two preceding species. A Proctotrupid, *Cephalonomia hypobori*, Kieff., occurs throughout the year; it appears to infest many different Scolytids.

Régnier (R.). **Un Ennemi des Plantes potagères,** *Corymbites* (*Diacanthus*) *latus* (**Elaterides**). [*C. latus*, a Pest of Vegetables.] —*Bull. Soc. Path. Vég. France, Paris*, viii, no. 1, January–March 1921, pp. 21–24. [Received 22nd June 1921.]

In the spring of 1920 vegetable gardens at Grand-Couronne (Seine-Inférieure) were severely infested by wireworms, the larvae being those of an Elaterid beetle, *Corymbites latus*, which has seldom been recorded hitherto as a serious pest.

The eggs are laid in May, and the young larvae appear two months later; they seem to feed on vegetable debris in the ground and probably live for some years. Early in April they are found at 2–4 in. beneath the surface. The author's observations confirm the fact that they are more dangerous in recently cleared ground, and this was the case in the infestation in question. Salads suffered severely. Salsify and young cabbages were also attacked. Carrots seemed to be immune.

The measures advised are watering with soapy water, fumigation with carbon bisulphide at the rate of about 1 oz. per square yard, and the clearing of all weeds. Salads should not be planted in places where infestation is probable.

Poutiers (R.). **Effets indirects des Attaques de la Pyrale du Maïs.**—*Bull. Soc. Path. Vég. France, Paris*, viii, no 1, January–March 1921, pp. 45–46. [Received 22nd June 1921.]

Much damage has been done to maize in the south of France by *Pyrausta nubilalis*, which is, however, checked to some degree by parasitic Diptera and Hymenoptera. When the caterpillar infests the stem near the head of maize, the injury becomes more important, as the wound attracts certain beetles that come to feed on the tissues and enlarge the hole made by the caterpillar. When the stem breaks under its own weight, these continue feeding on the interior, preventing the ripening of the head above. The beetles observed are *Cetonia aurata*, L., *Potosia morio*, F., *P. affinis*, Andsch., *Carpophilus hemipterus*, L., and *Cerambyx scopolii*, Füssl. The joint attack of several individuals soon weakens a stem so as to render it incapable of resisting the slightest wind. The collection and destruction of these beetles therefore seems advisable.

FROGGATT (W. W.). **A Novelty in Beetle Destruction.**—*Agric. Gaz. N.S.W., Sydney*, xxxii, no. 5, May 1921, p. 342.

The Forestry Commission has used with success a novel method of dealing with the grey-banded leaf-weevil, *Ethemaia sellata,* in New South Wales. This pest is very common in gardens, where both larvae and adults often attack carrots and other ground vegetables. The method, as described by Mr. W. Watson, Secretary to the Commission, consists in watering the plants well every morning, and then dusting them thoroughly with finely sifted lime, care being taken that the lime also falls on the soil around each seedling. The following morning the dead weevils could be gathered in numbers. There was no further trouble after a week's treatment.

FROGGATT (W. W.). **A Garden Fly Maggot** (*Bibio imitator*, **Walker**).—*Agric. Gaz. N.S.W., Sydney,* xxxii, no. 5, May 1921, p. 362, 4 figs.

A brief description is given of a Bibionid fly, *Bibio imitator,* Wlk., the larvae of which feed upon vegetable substances, especially the roots of grass.

MCDONALD (R. E.). **Pink Bollworm Conference at Washington.**—*Mthly. News Bull. Texas Dept. Agric., Austin,* iii, no. 8, June 1921, p. 3.

At a meeting of the entomologists from all the cotton states and experts of the Federal Horticultural Board held at Washington, 16th May 1912, the policies of the Federal and State Departments of Agriculture in dealing with the pink bollworm [*Platyedra gossypiella*] in Texas were endorsed [*cf. R.A.E.*, A, viii, 511; ix, 388]. As the eradication of the pest will benefit the nation at large, the funds required for the maintenance of non-cotton zones should be supplied jointly by the Federal and State Governments.

VAYSSIÈRE (P.). **La Lutte contre le Criquet marocain** (*Dociostaurus maroccanus,* **Thunb.**) **en Crau en 1920.**—*Ann. Epiphyties, Paris,* vii, no. 2, 1921, pp. 117–167, 11 plates.

Owing to the increase of locusts, *Dociostaurus maroccanus,* Thunb., previously reported [*R.A.E.*, A, vii, 432] the measures then advised were more or less completely adopted, and in 1920 an intensive campaign was conducted, of which a brief account has already been noticed [*op. cit.* ix, 137].

The present paper gives a very full description of the work. The wide, desert-like, stony areas of the Crau region limited the character of the measures applicable in it. Flame-throwers, poison-baits, chloropicrin sprays and collecting sheets were used, with satisfactory results.

Attention is drawn to the nitrogen contained in locusts; this amounts to over 8 per cent. in a fresh specimen, and the percentage rises to 11 in a desiccated specimen, and to 14 if it is also freed from fat. The financial success of a factory established in the region would seem assured. Contrary to many published opinions, the action of the flame-thrower does not destroy the organic matter, but simply dehydrates it.

The organisation of the campaign, which included the establishment of a Defence Syndicate, is dealt with in detail, and particulars are given of the measures planned for 1921.

de Stefani (T.). **Lotta contro la Mosca delle Ulive.** [Measures against the Olive Fly.]—*Allevamenti, Palermo,* ii, no. 6, 1st June 1921, pp. 170–171.

This article describes the losses due to the olive fly, *Dacus oleae,* Rossi, and the well-known Berlese method of poison-baits.

B[olle] (G.). **La Lotta contro il Bruco Geometra dei Ciliegi.** [Measures against the Cherry Geometrid.]—*Allevamenti, Palermo,* ii, no. 6, p. 171.

Very good results against the winter moth, *Cheimatobia brumata,* infesting cherry trees have been obtained by using the American banding specially prepared for this insect. It is imperative to band the trees immediately the first autumn frosts are expected. The adhesive should be spread on paper tied round the trunk, the width of the band being 6 in. It must be renewed when it ceases to be tacky, and left in position until May.

Corti (A.). *Lyctocoris campestris,* **F., un Nemico ignorato del Baco da Seta.** [*L. campestris,* a hitherto unknown Enemy of the Silkworm.]—*Atti Soc. Ital. Sci. Nat. in Milano,* lx, no. 1, 1921, pp 1–10.

In some Venetian localities a bug, *Lyctocoris campestris,* F., has killed large numbers of silkworms, attacking them through the walls of the cocoons.

Davidson (J.). **Biological Studies of** *Aphis rumicis,* **L. 1746.**—*Ann. App. Biol., Cambridge,* viii, no. 1, June 1921, pp. 51–65, 1 chart, 7 tables.

The experiments made in 1914 and interrupted by the war were resumed in 1920, with the object of obtaining a numerical expression of the infestation of plants by *Aphis rumicis* and of the relative susceptibility of its various food-plants [*R. A.E.*, A, ii, 660]. For the 1914 experiments described in the present paper the Aphids were reared in captivity from the eggs through successive viviparous parthenogenetic generations. The original eggs were taken from *Euonymus europaeus.* Thus the history of the Aphids was known, as also was the exact generation with which the plants were infested. An early viviparous parthenogenetic generation found on *E. europaeus* was used for the 1920 observations. The difficulties arising through variation in temperature were partly overcome by carrying out the infestations as far as possible in each series on the same day. The technique employed is described, also the influence of food-plants on the characters of the species.

Of the various plants tested, rapid development was maintained on broad beans, while on peas, mangels, sugar-beet, red beet and poppies, the figures were considerably lower and infestation somewhat slower. On dwarf French beans the colony died out, and on Carter's Canadian wonder bean only a few dwarfed individuals produced a few young. The sap from certain plant cells forms the food of the Aphids, and the hydrogen-ion concentration of this sap in relation to the relative susceptibility of plants to Aphid attack should be investigated.

Research as to the relative intensity of reproduction on different varieties of the same species is being continued, with the view to the possibility of breeding a resistant strain. It is possible that reproduc-

tion on certain intermediate food-plants may be affected by the nature of the preceding one; this question, however, requires further investigation with reference to the factors concerned, especially the condition of the food-plant and temperature. Other factors influencing the constitution of the cell sap of plants are climate, soil conditions, agricultural methods, and manurial treatment. It is also probable that the wide range of variation in numbers on different varieties of plants is also largely due to the variable fertility of the agamic females. The greatest reproduction occurs with the early viviparous generations; thus there would appear to be some relation between the time of the year and the degree of infestation.

MORRILL (A. W.). **Report of the Entomologist.**—*10th Ann. Rept. Arizona Commiss. Agric. & Hortic. 1917–18, Phoenix,* 1919, pp. 29–73, 13 figs., 2 plates, 7 tables. [Received 21st June 1921.]

The area under cultivation in Arizona during 1917 was largely increased, and accordingly pest control became more important. At the present time the alfalfa weevil [*Hypera variabilis*], the pink boll-worm [*Platyedra gossypiella*], and the cotton boll weevil [*Anthonomus grandis*] are the greatest insect menaces.

The usual inspection was made of orchards and nurseries for the location and eradication of pests. Spraying operations were continued against the codling moth [*Cydia pomonella*] and the San José scale [*Aspidiotus perniciosus*].

Control measures were adopted against grasshoppers infesting lucerne, and one species, *Eucoptolophus subgracilis*, Caudell, caused severe damage to vegetables. Tests with grasshopper baits were continued during 1917 and 1918, on cotton and lucerne fields, against *Melanoplus differentialis*. A combination of half and half wheat bran and pine sawdust was found equal to and easier to distribute than wheat bran only, while sawdust alone is definitely inferior. Barley middlings give fairly good results when substituted for wheat bran. As ingredients in poisoned baits, molasses, especially the darker grade, are unnecessary, and if used with citrus fruits reduce the effectiveness of the bait. Cantaloups and oranges are superior to lemons, and the former are cheaper. London purple is inferior to Paris green. Dry horse manure as a substitute for wheat bran is only recommended for use in emergencies.

The principal means of destroying cutworms are poisoned baits, and the usual grasshopper bait is generally recommended. It can be assumed that lemons and molasses are of no value in these baits. In the autumn of 1918, excellent results were obtained against *Feltia annexa*, Tr., by using the bran, Paris green and water combination.

Experiments were carried out in 1918 for the control of *Lygus elisus* var. *hesperus*, Knight, and *L. pratensis oblineatus*, Say (cotton-square daubers). At present remedial measures cost more than the slight damage the bugs cause to crops. It was found that lucerne fields heavily infested with these pests seriously menace neighbouring cotton fields. Lucerne fields should be cut so that these bugs, as well as grasshoppers, are concentrated in the centre, which should be left uncut. They can then be collected by means of a hopperdozer.

The peach-twig borer [*Anarsia lineatella*] is the most troublesome peach insect. The eastern peach-tree borer [*Aegeria exitiosa*], previously only recorded near Prescott, has now been reported at Payson. *Frankliniella morilli*, Morg. (apricot thrips) only caused

slight damage compared with previous seasons. *Tetranychus bimaculatus*, Harv. (the two-spotted red spider) damaged some dewberries; spraying with atomic sulphur proved unsatisfactory. Borers were reported working in the trunks of olive trees, and on examination it was thought they were a new species of Phycitid. Leaf-cutting bees seriously damaged apricots and plums.

A weevil, *Sphenophorus phoeniciensis*, is reported as damaging barley. Milo maize seed, while germinating in the ground, was considerably damaged by *Solenopsis geminata* var. *xyloni*, McCook (fire ant). The seed should be soaked in coal oil for at least half-hour to protect it. A new pest of this crop has been identified as a leaf-cutting ant, *Atta* (*Moellerius*) *versicolor*, Perg.

The corn-stalk borer previously recorded as *Diatraea zeacolella*, Dyar [*R.A.E.*, A, v. 316; vii, 205] has finally been determined to be *Diatraea lineolata*, Walk.

Considerable damage to fields and lucerne crops was caused by the cutworm, *Lycophotia margaritosa*, Haw. (*saucia*, Hb.), but it was destroyed by poison baits. *Feltia annexa*, Tr. (granulated cutworm) was also killed with bran, Paris green and water, broadcasted over lucerne fields. *Heliothrips fasciatus*, Perg. (bean thrips) was abundant in lucerne fields. It usually attacks beans, and has been known to destroy cotton. Lucerne infested before the middle of September should be sprayed to prevent adjacent cotton fields from being invaded.

Vegetable crops were attacked by the usual pests. *Pieris* (*Pontia*) *rapae*, L., *Plutella maculipennis*, Curt., and *Phytometra* (*Autographa*) *brassicae*, Riley, all attacked cabbages, the latter being the most common; 4 lb. of lead arsenate powder to 50 U.S. gals. water, with a small quantity of soap, proved a satisfactory spray. Melons were considerably damaged by *Diabrotica soror*, Lec. (Western twelve-spotted cucumber beetle). The larvae eat the roots, while the adults destroy the leaves. An effective spray is 3 oz. lead arsenate to 2 U.S. gals. water, or 1 oz. lead arsenate to 1 U.S. gal. Bordeaux.

Bean crops have been much damaged by the bean ladybird [*Epilachna corrupta*]. The spray recommended is 2–4 lb. powdered lead arsenate to 50 U.S. gals. water, or powdered lead arsenate mixed with sulphur can be used as a dust. Hand picking of the adults has also proved satisfactory.

New cotton pests of interest include: a scale, *Phenacoccus cevaliae*, Ckll., *Cicada cinctifera*, previously recorded as a pest of fruit trees, an unidentified wireworm, and a Tenebrionid beetle, *Blapstinus pimalis*. The last-named has previously been recorded as a vegetable pest [*R.A.E.*, A, iii, 512], and should now be classed among the occasionally destructive pests of cotton in Arizona. During the latter part of April some young cotton plants were damaged by wireworms, but attempts to rear adults for identification were unsuccessful. The most noteworthy cotton damage was caused by *Cicada cinctifera*. The egg punctures on the branches destroyed the bolls. The only remedy that can be suggested is knocking the insects into water covered with a film of coal oil. *Aphis gossypii* (cotton or melon aphis) was prevalent in April on young cotton plants, but Hymenopterous parasites had destroyed the pest by May. Late-planted cotton suffered the most. *Thrips arizonensis* (cotton thrips) also damaged young plants. The cotton bollworm [*Anthonomus grandis*] did not cause excessive damage. Further information on *Myochrous longulus*,

Lec. [*op. cit.*, vi, 22; vii, 206] states that only one cotton field was seriously damaged, and that on low ground and very late. *Euschistus impictiventris*, Stål (brown cotton bug) was the most conspicuous plant bug reported, but it caused only slight damage.

LAUDERDALE (J. L. E.). **The Cotton Aphis in the Yuma Valley in 1918.**—*10th Ann. Rept. Arizona Commiss. Agric. & Hortic., 1917–18, Phoenix*, 1919, pp. 73–74. [Received 21st June 1921.]

The worst outbreak ever experienced of the cotton aphis [*Aphis gossypii*] in the Yuma Valley occurred in July 1918.

Spraying was immediately undertaken and was proving effective, when, after four weeks, natural enemies appeared and exterminated the pest in ten days. These included Hymenopterous parasites, Syrphid flies and Coccinellids.

BARTLETT (O. C.). **Annual Report of Assistant State Entomologist.**—*11th Ann. Rept. Arizona Commiss. Agric. & Hortic., 1918–19, Phoenix*, 1920, pp. 35–46, 2 figs. [Received 21st June 1921.]

The character of the work undertaken by the Commission during the year is discussed, and the various demonstrations and inspection tours are described.

Lucerne was heavily infested by cutworms in May, but they were successfully destroyed by a poison bran mash consisting of 30 lb. bran, 2 U.S. qts. heavy black molasses, 1 lb. Paris green, and enough water to hold the mash.

Normal crops of lucerne, melons, grain and cotton were obtained by adopting in July the usual measures against grasshoppers.

Spraying demonstrations and advice were given for the control of the following pests: codling moth [*Cydia pomonella*], woolly apple aphis [*Eriosoma lanigerum*], San José scale [*Aspidiotus perniciosus*], grape leaf-hopper [*Typhlocyba comes*], and red spider and Aphids on cotton.

GEORGE (D. C.). **Root-knot or Nematodes.**—*11th Ann. Rept. Arizona Commiss. Agric. & Hortic., 1918–19, Phoenix*, 1920, p. 59, [Received 21st June 1921.]

Heterodera radicicola caused serious damage during 1919. This Nematode ruined a field of cantaloups and killed many peaches, apricots and almonds. It is chiefly found in loose, sandy, moist soil. It feeds upon the small roots, causing them to develop small galls or knots. It was observed that a rosette development of many rootlets was characteristic on roots nearest the soil surface, especially those of apricot and peach trees. Cotton plants were not attacked, although cowpeas in the same field had been infested.

LAUDERDALE (J. L. E.). **Annual Report of the Assistant Entomologist at Yuma.**—*11th Ann. Rept. Arizona Commiss. Agric. & Hortic., 1918–19, Phoenix*, 1920, pp. 63–75. [Received 21st June 1921.]

The insect pests intercepted, which show a considerable decrease since the preceding year, included:—*Chrysomphalus aurantii* (red scale), *Aspidiotus hederae* [oleander scale], *Coccus hesperidum* [soft brown scale], and other Coccids, Aphids, and two cases of root-knot [*Heterodera radicicola*].

The Coccinellids that checked the serious outbreak of the cotton aphis [*Aphis gossypii*] which occurred in July 1918 [see preceding page] were :—*Hippodamia convergens, Coccinella novemnotata, Adalia bipunctata, Megilla maculata* and *Chilocorus bivulnerus*.

The damage caused by *Heliothis obsoleta*, F. (cotton bollworm) was more severe. Most of the injury occurred in the square and bloom stage, and experiments will be carried out in spraying with lead arsenate powder at this stage. A new species of thrips was very abundant on young cotton in May.

Myochrous longulus, Lec., was more general, and one month earlier than in the previous season. In one instance, in a heavily infested field of heavy soil, the beetle was successfully destroyed by flooding.

Bucculatrix thurberiella, Busck (cotton leaf-perforator) and *Estigmene acraea* (salt-marsh caterpillar) were less abundant than usual.

Elasmopalpus lignosellus, Zell. (lesser corn-stalk borer) was noted on beans. The larvae tunnel the stalks at or just below the surface of the ground, causing the plant to wilt. The destruction of all plants showing signs of attack and rotation of crops are advised against this moth.

Against *Diabrotica vittata*, F. (striped cucumber beetle), on squash, melons and beans, satisfactory results were obtained by spraying with 2 lb. lead arsenate powder to 50 U.S. gals. water.

Among pests of fruits and vines the grape leaf-hopper [*Typhlocyba comes*] was reported to be prevalent, but satisfactory results were obtained by spraying with Black-leaf 40 and whale-oil soap.

Inspection of Plant, Fruit and Seed Importations.—*11th Ann. Rept. Arizona Commiss. Agric. & Hortic., 1918–19, Phoenix,* 1920, pp. 76–78, 4 tables. [Received 21st June 1921.]

The following pests were intercepted by various inspectors in Arizona :—*Aleurodes spiraeoides, Heterodera radicicola, Aspidiotus perniciosus* (San José scale), *Saissetia oleae* (black scale), *Pseudococcus citri, Chrysomphalus aurantii* (red scale), *Aspidiotus hederae* (ivy scale) and *Coccus hesperidum* (soft brown scale).

Bruttini (—). **On the Mixture consisting of Lime-sulphur or Polysulphides of Calcium as Insecticide or Fungicide.**—*Rome,* Imprimerie polyglotte l'Universelle, 1920, 36 pp., 6 figs. (Abstract in *Internat. Rev. Sci. & Pract. Agric., Rome,* xi, no. 4, April 1920, pp. 525–527.) [Received 22nd June 1921.]

Instead of making lime-sulphur mixture with definite proportions of lime and sulphur treated with boiling water, the author has patented a process by means of which polysulphides of calcium are obtained in a super-concentrated mixture at 35°–40° Bé. from sulphur produced by purifying gas for illumination in a special manner, instead of from commercial sulphur. This preparation is being made at a gas works and is being sold as " Supersolfo."

One of the most important characteristics of this substance is that it exhibits great resistance to the action of the air, with the result that there is no continuous formation of insoluble crystals of calcium sulphite, as is the case with the mixture made from commercial sulphur; there is, further, a fair content of iron in the soluble state, not combined with cyanogen. This is important in view of the fact that the action of polysulphides on plants is, in this case, increased by that of the iron.

The chemical composition of the mixture is very complex and still uncertain, but it may be assumed that it is a solution of calcium tetrasulphide and pentasulphide with small quantities of hyposulphite.

The action of polysulphides on plant pests has in some cases been attributed to the action of sulphur vapour and in others to oxidation of the sulphur, with the production of sulphur dioxide. Polysulphides rapidly extract the oxygen from insects, thus disorganising their tissues, and even leading to asphyxiation. The production of sulphuretted hydrogen by the action of the carbon dioxide of the air should also be considered.

The following insects may be successfully dealt with by using this substance: *Tetranychus telarius, T. mytilaspidis, Chrysomphalus dictyospermi, Ceroplastes rusci* (fig scale), *Eulecanium* (*Lecanium*) *persicae* (peach scale), *Saissetia oleae* (black scale), *Eriosoma* (*Schizoneura*) *lanigerum, Hyponomeuta malinellus* and *Cydia* (*Carpocapsa*) *pomonella,* as well as various fungus diseases.

Starting with a basal mixture at 21°–24° Bé., spraying in winter should be done with 8–10 per cent. strength and in spring and summer 5–6 per cent. As the density is 35°–40° Bé., from 29 to 40 parts of the mixture should be used per 1,000 of water in winter and 18 to 20 parts for spring and summer use.

WEISS (H. B.). **Popular and Practical Entomology: The Apple Leaf-crumpler as a Pest of** *Cotoneaster.—Canadian Ent., Guelph,* liii, no. 4, April 1921, pp. 73–75.

Mineola indiginella, Z., is recorded from New Jersey as feeding on ornamental shrubs (*Cotoneaster microphylla* and *C. horizontalis*). There is only one brood during the year. The eggs are laid in July, and the resulting larvae hibernate. They become full-grown about the first or second week in June. A description of the larva is given. The moth is parasitised to some extent by *Tachina phycitae,* Le B. Arsenicals applied to the plants early, as in the case of apples, should prove effective.

BIRD (H.). **New Species and Life-histories in** *Papaipema,* **Sm. (Lepidoptera) no. 20.**—*Canadian Ent., Guelph,* liii, no. 4, April 1921, pp. 79–81.

Superficial observations have frequently resulted in the confusion of injury to maize by *Papaipema nebris,* Gn., with that by *Pyrausta nubilalis,* Hb. (European corn borer). The favourite food-plants of *P. nebris* belong to the Ambrosiaceae, especially *Ambrosia trifida.* These weeds are frequently found on the borders of cultivated fields, and should the original food-plant not be sufficient for the numerous larvae, they will readily turn their attention to maize. They descend into the head of the leaf whorl and prevent the ear from maturing by destroying the embryonic flower head. This moth is able to complete its life-cycle on maize. Although it is heavily parasitised by *Masicera senilis,* Mg., and *Microplitis gortynae,* Riley, when feeding on *Ambrosia* spp., these natural enemies apparently do not follow it to maize, and it may therefore become a pest of serious economic importance.

BAKER (A. C.). U.S. Bur. Ent. **Note on the Rosy Aphis.**—*Canadian Ent., Guelph,* liii, no. 4, April 1921, p. 95.

Recent examinations of the type of *Aphis malifoliae,* Fitch, prove this species to be a synonym of *A. crataegifoliae,* Fitch. The rosy apple aphis recorded as *A. malifoliae* [*R.A.E.,* A, v, 49, 550, etc.] is therefore now given the name of *Anuraphis roseus.*

Departmental Activities: Entomology.—*Jl. Dept. Agric. Union S. Africa, Pretoria,* ii, no. 6, June 1921, pp. 492–496.

It is probable that in the coming season there will be a greater outbreak of locusts over a much larger area. Many swarms of hoppers escaped detection in thinly populated districts, and there has been an extraordinary prevalence of solitary locusts.

The larvae of a Coccinellid, *Ortalia pallens,* Muls., have been found to inhabit the nests of ants, *Pheidole punctulata,* Meyr., and to prey upon them.

Weevils of the genus *Protostrophus* frequently do much damage in plantations. Early this year many transplanted Eucalyptus trees were destroyed by one of these weevils, *P. amplicollis,* also known as a pest of maize in certain soils. The injury was restricted to blocks of trees where maize had been previously cultivated. Young trees, including fruit trees, are also often attacked by the wingless weevils of this genus. The attack, confined to newly cultivated lands, is due to the fact that larvae are present in the soil when it is broken up. Weevils of this genus have also defoliated some one-year-old trees of *Pinus insignis* and also the terminal growth of young *Eucalyptus saligna,* the main damage being done early in April; hand collection has not proved satisfactory.

Pettey (F. W.). **Codling Moth and Red Scale Control Investigations.**—*Jl. Dept. Agric. Union S. Africa, Pretoria,* ii, no. 6, June 1921, pp. 500–501.

These notes are published as a preliminary report on the 1920–21 season.

Experiments in dusting versus spraying for the control of codling moth [*Cydia pomonella*] showed that 20 to 30 per cent. more clean fruit was produced by spraying in six applications with a liquid spray of 2½ lb. lead arsenate paste to 40 gals. of water than by dusting with 15 lb. lead arsenate powder in 85 lb. fine lime. It is considered, however, that the failure of dusting has not been proved until a better quality of lime has been imported into the country for testing. On the other hand, paste or powdered lead arsenate of South African manufacture were found fully as reliable as imported brands. Calcium arsenate, which is cheaper than lead arsenate, and has recently been found efficient in the control of codling moth in North America, is a failure under South African conditions. Its efficiency might be improved by strengthening the solution, but much increase in strength would makes its substitution for lead arsenate no saving in cost. Regarding the use of Bordeaux mixture instead of water in lead arsenate sprays, experiments indicate that it slightly reduces the efficiency of the lead arsenate. Until this is further investigated, fruit growers should not use less than 2½ lb. paste or 1¼ lb. powder lead arsenate in 40 gals. Bordeaux. Sodium arsenite proved inefficient in killing capacity and injurious in scorching foliage, and its use in orchards is therefore not recommended.

Experiments with concentrated lime-sulphur against the red scale [*Chrysomphalus aurantii*] indicate that it cannot be effectively controlled by one dormant spray of lime-sulphur at a dilution of 1 : 10 (4·5° to 5° Bé.), but that in addition to the winter application two foliage sprays of a 1 : 40 (or 1° Bé.) dilution would be much more effective. If this proves to be the case in seasons of normally warm springs, fruit-growers of the coastal Cape regions should

consider the substitution of lime-sulphur foliage sprays for Bordeaux mixture, as this would assist in the control of young migrating scale insects and would also prevent fungous diseases. Inland fruit-growers, where the spring is dry and hot, should use concentrated lime-sulphur as a foliage spray with caution, as it is likely to produce scorching. It is intended that the above experiments should be repeated and extended before the conclusions are put into practice by the fruit-grower.

YUSOPE (M.). **Some Insect Pests of Padi.**—*Agric. Bull. F.M.S., Kuala Lumpur*, viii, no. 3, July–September 1920, pp. 187–189. [Received 28th June 1921.]

The most serious pests of padi in Malaya include the stem borer, *Schoenobius incertellus* (*bipunctifer*), the eggs of which are deposited in clusters on the leaves. The larvae congregate at the tips of the leaves and are blown by wind to neighbouring plants. The caterpillar bores into the stem until it reaches the heart of the plant, and pupates inside the hole where it has been feeding, the adult emerging through the hole previously made during the young stage. Light traps are successful in attracting large numbers of the moths. The egg-masses are conspicuous on the leaves and can easily be destroyed. Pupae frequently occur in the stubble after harvest. These should be destroyed by ploughing or burning. Infestation can be detected by the dead or withered condition of the central shoots, and all such plants should be cut and burnt at once.

The leaf-hopper, *Nephotettix bipunctata*, generally deposits a single egg in an opening at the inner side of the leaf sheath, one female depositing from 70 to 136 eggs. These hatch after six days, and the nymphs feed for about 18 days on the sap of the stem and leaves. After five moults they assume the winged stage, the adults continuing to feed in the same manner. The adults are active in searching for food and are capable of flight; they also exude honeydew on to the stems and leaves. In cases of serious infestation whole fields may be destroyed by this insect. Sweeping with a hand-net is recommended, and padi stubble should be cut and burnt immediately to destroy any eggs.

A bug, *Podops coarctata*, attacks rice in a somewhat similar way. Eggs are laid on any part of the plant or in cracks in the soil; the larvae and adults prefer cool places, but in moist weather they live under the leaves. Each female lays from 30 to 40 eggs, generally resting upon them for from five to seven days, when they hatch. The nymphs begin feeding in the second instar, and continue for about 50 days, during which they undergo five moults. The decayed parts of stems and grasses are chiefly attacked, and subsequently the rice stems and leaves. Plants previously attacked by stem borers are particularly liable to injury. Flooding is recommended, and during this the insects can be collected and crushed. An egg-parasite has been found that considerably reduces the numbers of this bug.

Leptocorisa varicornis lays rows of dark brown eggs on the leaves of padi and grasses. Both the nymphs and adult bugs attack the ripening grain, sucking the juice so that the grain is empty. The insects congregate in cool places and are frequently found among peas and beans. As one female deposits about 10 eggs, and as the

insects can live throughout the year on grain-bearing grasses, it is probable that they must be considered a serious pest of padi. Collecting the bugs in hand-nets and destroying them in kerosene and water is advocated.

Ponniah (D.) **Insect Pests of Coconuts.**—*Agric. Bull. F.M.S., Kuala Lumpur,* viii, no. 3, July–September 1920, pp. 192–195. [Received 28th June 1921.]

Young coconut plantations in Malaya suffer considerably from the attacks of termites, especially in places where timber has been left lying for two or three years. If the nests in the timber are disturbed, or if the insects are short of food, they migrate to young coconut or rubber trees in the vicinity. Complete destruction of all timber is the remedy, and cleanliness in coconut plantations is of the greatest importance.

The moth, *Brachartona catoxantha,* Hmps., oviposits on the lower surface of the leaves, and the caterpillars devour them, causing the nuts to fall off or remain undeveloped. The palms generally recover when fresh leaves have grown. The larvae pupate on the leaves or other parts of the tree, and the adults emerge after about nine days. Parasites of the caterpillars include a Tachinid and a small Hymenopteron. A fungus also attacks them, and these enemies, together with climatic conditions, eventually control the infestations. Many remedial measures have been tried, but the results are considered inconclusive. The lower leaves of infested palms should be removed and burnt ; this should be done on the first appearance of the moths, when the least injury will be done to the parasites. From 9 a.m. till 2 p.m., and during the night, the moths are inactive and can be collected in hand-nets or crushed while on the trees.

The Hispid beetle, *Plesispa reichei,* formerly recorded as *Brontispa froggatti* [*R. A.E.*, A, vi, 523], passes its life between the newly opening fronds and the young leaves, and is gradually becoming a serious pest. The life-cycle occupies about two months. Experiments with remedial measures will shortly be tried ; poison sprays are impracticable, and as yet no predators or parasites have been observed. The only remedy suggested is to press the leaflets together between the thumb and forefinger, so as to kill all stages of the insect found between and inside them.

The coconut-spike caterpillar and the rhinoceros beetle [*Oryctes rhinoceros*] are both important pests [*R. A.E.*, A, vii, 128], and the red weevil [*Rhynchophorus ferrugineus*] frequently oviposits in places damaged by *O. rhinoceros.* As these beetles are attracted by rotting coconut stems, in which they breed, lengths of palm wood should be used as traps, but these should be burnt at least every month, and the beetles must be collected every morning and destroyed. All stumps, trunks, and soft parts of coconut trees, when cut down, or when they die, must be immediately destroyed Other remedial measures will be tested before being recommended for general use in Malaya.

Minor pests are skipper butterflies and bagworms, which are generally kept in check by natural enemies, and scale-insects and mealy-bugs, the life-histories of which require investigation.

Amendment to the Regulations under the Destructive Insect and Pest Act. Amendment no. 12 (No. 2 of 1921).—*Canada Dept. Agric., Ottawa,* MS. [Received 28th June 1921.]

The Amendment No. 10 to this Act, dealing with the European corn borer [*Pyrausta nubilalis*], passed on 24th May 1920 [*R.A.E.*, A, viii, 416], is rescinded by an Order-in-Council dated 12th May 1921. In substitution therefor it is enacted that maize and broom maize, including all parts of the stalk, cut flowers or entire plants of chrysanthemums, aster, *Cosmos, Zinnia*, hollyhock and cut flowers or entire plants of *Gladiolus* and *Dahlia*, except the bulbs thereof without stems, and oat and rye straw as such or when used for packing, throughout the entire year, also celery, green beans in the pod, beet with tops, spinach and rhubarb, from 1st June to 31st December, are prohibited entry into Canada from certain districts enumerated in the States of Massachusetts, New Hampshire, New York and Pennsylvania, unless they are accompanied by a certificate of inspection issued by the U.S. Department of Agriculture stating that the shipment is free from infestation by *P. nubilalis*. The prohibition does not apply to the articles enumerated when they have been manufactured or processed in such a manner as to eliminate risk of carriage of *P. nubilalis*, nor to cleaned shelled maize, nor to cleaned seed of broom maize.

Work connected with Insect and Fungus Pests and their Control.—*Rept. Agric. Dept., St. Vincent, 1st April–31st December 1919, Barbados,* 1921, pp. 13–14. [Received 29th June 1921.]

The work connected with cotton-stainers [*Dysdercus*] included the destruction and pruning of silk-cotton trees (*Eriodendron anfractuosum*) and John Bull trees (*Thespesia populnea*). During May stainers were found in the northern part of the island feeding on seeds of *Sterculia caribaea* (Mountain John Bull), and observations apparently confirm the conclusions arrived at in a previous report with regard to the role played by this tree [*R.A.E.*, A, viii, 206]. Late in the year cotton in the southern part of the island was severely attacked by *Alabama argilacea*. *Nezara viridula* was generally distributed, but was controlled by egg-parasites. Pests of minor importance occurring on cotton were scale-insects, *Eriophyes gossypii* (leaf blister mite), cotton aphis [*Aphis gossypii*] and the bronze beetle [*Colaspis fastidiosa*].

Pests of other crops are: *Euscepes* (*Cryptorrhynchus*) *batatae* and *Tetranychus gloveri* on potatoes; *Aspidiotus destructor* and a white fly [*Aleurodicus*] on coconuts; *Laphygma frugiperda* (corn ear worm) and *Heliothis obsoleta* (bollworm) on maize, and a bug, *Corythuca* sp., on castor-oil plants.

The shield-scale fungus (*Cephalosporium lecanii*) was common in some localities on scale-insects attacking mango trees.

Plant Legislation.—*Rept. Agric. Dept., St. Vincent, 1st April–31st December 1919, Barbados,* 1921, pp. 14–15. [Received 29th June 1921.]

The importation of banana plants, suckers, cuttings or any parts thereof, as well as earth and packing, from Central and South America, Trinidad and Grenada, and coconuts from these places, as well as from Cuba, Jamaica and Tobago, is prohibited. A proclamation has also been issued prohibiting the importation of citrus plants and parts thereof from any country other than Dominica, Montserrat and St. Lucia.

Report of the Commission on the Root-borer and the Brown Hardback of the Sugar-cane in Barbados.—*Barbados*, 1919, 40 pp. [Received 29th June 1921.]

This report has been largely compiled from the evidence of 28 growers of sugar-cane, whose statements are reproduced verbatim, and from previous publications. A map shows the distribution of *Diaprepes abbreviatus*, L. (root-borer of sugar-cane) and of *Lachnosterna* (*Phytalus*) *smithi*, and accounts are given of the life-history and habits of these two beetles [*R. A. E.*, A, ii, 531 ; vii, 414, etc.].

A number of recommendations have been drawn up by the Commission, many of which have been advocated in previous years [*R. A. E.*, A, i, 98 ; iv, 10 ; v, 365, etc.]. The value of agricultural methods, and particularly of resting the land and of rotation of crops, was emphasised by the majority of the witnesses. Collection of beetles should be made every day or every other day as long as any are to be found ; this will ensure their capture before oviposition.

The Scoliid parasite, *Tiphia parallela*, should be encouraged wherever it occurs and should be distributed in those districts where it does not exist, as its numbers are insufficient, without artificial assistance, for the control of *L. smithi* [*R. A. E.*, A, ix, 145].

Cassava and peas are suggested as trap crops to be planted around sugar-cane fields ; from these the insects can be collected at night by means of lanterns. The split ends of the leaves of sugar-cane, containing eggs of *D. abbreviatus*, should be cut off and the ends destroyed. Poultry and pigs should be utilised for the destruction of *L. smithi* ; the presence of toads and lizards, which destroy both pests, should be encouraged, cement water-cisterns being built for the former, and the mongoose, which has largely contributed to the disappearance of these enemies, should be exterminated.

LEES (A. H.). **Apple Blossom Weevil.**—*Ann. Rept. Agric. & Hortic. Res. Sta., Long Ashton, Bristol*, 1920, pp. 71–73. [Received 30th June 1921.]

The apple blossom weevil [*Anthonomus pomorum*] caused serious damage to the apple crop in 1920. Investigations are now in progress with a view to ascertaining some means of satisfactory control for this pest. Preventive measures to be tested include lime sprays and trapping.

LEES (A. H.) & PEREN (G. S.). **Spraying Trial for Control of Logan Beetle.**—*Ann. Rept. Agric. & Hortic. Res. Sta., Long Ashton, Bristol*, 1920, pp. 74–77. [Received 30th June 1921.]

Byturus tomentosus is one of the most serious pests of loganberries. The beetles hibernate in the ground and appear a week or two before the first flowers of the plants. As soon as the flowers open, eggs are laid in them, and the resulting larvae bore into the receptacle of the fruit. The direct and indirect damage causes loss of size, shape and weight.

During 1920 the plants were sprayed when about two-fifths of the blossoms were out, and again when about four-fifths were out, the dates of application being 19th and 27th May. The spray consisted of 6 lb. lead arsenate, 10 lb. soft soap, and 100 gals. water, applied at a pressure of 125 lb. per square inch.

The results show that the infestation was reduced from 24 per cent. to 15 per cent., but the effect of spraying was less marked as the season advanced, indicating the desirability of a third application.

Ballard (E.). **Tea Helopeltis.**—*Planters' Chron., Coimbatore*, xvi, no. 23, 4th June 1921, pp. 377–378.

The importance of Mr. Andrews' discovery [*R.A.E.*, A, viii, 204] regarding the value of potassium salts in the soil in which tea is grown, as a repellent for *Helopeltis*, is pointed out. While this is apparently a successful remedy in Assam, it may not be equally so in southern India. It would be of interest to ascertain whether the species of *Helopeltis* concerned in southern India is *H. theivora*, as in Assam, or, as seems probable, *H. antonii*.

Felt (E. P.). **Indian Grass Gall Midges.**—*Mem. Dept. Agric. India, Pusa*, Ent. Ser., vii, no. 3, February 1921, pp. 15–22. [Received 30th June 1921.]

The gall-midges dealt with include *Dyodiplosis indica*, sp. n., from galls on *Andropogon schoenanthus*; *D. monticola*, sp. n., from galls on *A. monticola*; *D. plumosa*, sp. n., from galls on *A. annulatus* and *Iseilema laxum*; and *Orseoliella graminis*, sp. n., from galls on *A. squarrosus*.

A key is given to the Indian species of *Dyodiplosis*.

Leiby (R. W.). **The Larger Corn Stalk-borer in North Carolina,** *Diatraea zeacolella*, **Dyar.**—*Bull. North Carolina Dept. Agric., Raleigh*, xli, no. 13, August 1920, 85 pp., 27 figs. [Received 30th June 1921.]

The principal food-plant of *Diatraea zeacolella*, Dyar, is maize, and in North Carolina the only alternative food-plant is apparently *Sorghum* sp. The classification and synonymy of this moth are discussed, and the means of distinguishing the injury it causes from that of the beetles, *Diabrotica duodecimpunctata*, F., and *Sphenophorus callosus*, Oliv., and *Heliothis obsoleta*, F. (corn ear worm) are given.

The various stages of this moth and its life-history as occurring in North Carolina [*R.A.E.*, A, vii, 380] are described. In addition to the egg-parasite mentioned, an undetermined Ichneumonid and a Pteromalid (*Eupteromalus* sp.) have been bred from the pupae. The hibernating larvae are attacked by the fungi, *Metarrhizium anisopliae* and *Hirsutella* sp. The larvae of *Chauliognathus pennsylvanicus*, De G., are predaceous on the larvae and pupae of *D. zeacolella*, and a species of *Leucotermes* has been found in the larval tunnels in winter stubble.

Experiments with regard to the time of planting and consequent injury show that maize planted before 25th May is subject to attack by both generations. The infestation by the first brood may amount to from 70 to 90 per cent. of the stalks. When the plants are nearing the tassel stage the larvae of the second brood are unable to injure the bud, and the damage is almost entirely confined to boring in the stalk. It is thought that the erratic time of planting that is practised serves to maintain the pest continuously in more or less destructive but not epidemic numbers. It is advisable to plant maize after 25th May, so that the crop escapes injury by the first brood and is too far advanced in growth to suffer much from the second brood. All

stubble should be disturbed in the autumn by ploughing. If late planting and the disturbance of stubble were practised systematically for one or two years, the pest would be greatly reduced, if not eradicated. Spring ploughing should be done before 15th May, and all stalks and stubble should be burnt before 10th May. In addition to these measures rotation of crops and heavy fertilising, so that the plant may outgrow the injury, are advocated.

Melander (A. L.). **First Annual Report of the Division of Apiculture.**—*Washington State Coll., Pullman,* 1st March 1921, 119 pp., 32 figs.

In discussing the general management of bees, the diseases dealt with include European and American foulbrood and Isle of Wight disease, recommendations being made for their treatment and prevention. The insect enemies of the hive bee include wax-moths [*Galleria mellonella*], wasps, ants and earwigs.

Wilson (H. F.). **How to Control American Foulbrood.**—*Wisconsin Agric. Expt. Sta., Madison,* Bull. 333, May 1921, 21 pp., 8 figs.

The general symptoms of sacbrood, European foulbrood and American foulbrood are described, and recommendations are made for controlling the latter.

Metalnikow (S.). **L'Immunité naturelle et acquise chez la Chenille de** *Galleria mellonella.* (**Deuxième Mémoire.**)—*Ann. Inst. Pasteur, Paris,* xxxv, no. 6, June 1921, pp. 363–377, 5 figs.

In a previous paper [*R. A. E.*, A, viii, 163; B, viii, 86] the immunity of the caterpillar of *Galleria mellonella* to various micro-organisms was dealt with.

With a view to studying acquired immunity a number of experiments were made with pneumococci and the causative organism of plague. It was found that *G. mellonella* exhibits a considerable degree of immunity to plague, though not to the same extent to tuberculosis and diphtheria. Virulent pneumococci rapidly cause death, but after being injected with a small dose of non-virulent pneumococci or pneumococci heated to 58° C. (136° F.) the caterpillar becomes immune in 24 hours. In all these cases of acquired immunity no antibodies were seen in the blood, and it may be said that the essential point is the change in the activity and sensibility of the phagocytes. The cells, adapting themselves to new conditions, change their reactions, negative reactions being replaced by positive ones.

Green (E. E.). **Observations on British Coccidae, with Descriptions of New Species.**—*Ent. Mthly. Mag., London,* Third Ser., no. 79, July 1921, pp. 146–152, 4 figs.

The species dealt with are: *Ortheziola vejdovskyi*, Sulc.; *Orthezia urticae*, L., on *Artemisia maritima* and *Teucrium scorodonia*; *Eriococcus inermis*, Green, on *Festuca ovina*; *E. glyceriae*, sp. n., on *Glyceria maritima*; *E. placidus*, sp. n., on the upper surface of leaves of grass (? *Festuca* sp.); *E. pseudinsignis*, sp. n., on grass (? *Festuca* sp.); *Phenacoccus aceris*, Sign., on stems of peach trees under glass; *Pseudococcus gahani*, Green, on *Ceanothus*, sp.; *P. walkeri*, Newst., inside grass stems; *P. maritimus*, Ehrh., on *Nerium* and *Abutilon* under glass.

P. longispinus latipes recorded as a new variety [*R. A. E.*, A, vi, 59] should be referred to *P. maritimus*.

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Walker (J. J.). *Hylastes attenuatus,* **Er., and other Coleoptera in the New Forest.**—*Ent. Mthly. Mag., London,* Third Ser. no. 79, July 1921, p. 153.

Hylastes attenuatus, Er., is recorded as being apparently now well established in the New Forest.

Herdman (W. A.). **Final Report to the Council of the Royal Society and the Ministry of Agriculture and Fisheries, on the Work of the Grain Pests (War) Committee.**—*Repts. Grain Pests (War) Committee, Royal Society, London,* no. 10, February 1921, 16 pp

In this, the final report of the Grain Pests (War) Committee, a brief summary is given of the earlier reports, all of which have been previously noticed, except no. 9, in which a complete list of the grain pests identified during the work of the Committee is given, with information regarding their abundance, economic importance, geographical distribution, and descriptions of new or unrecognised Hymenopterous parasites. Among parasites, the commonest are the Chalcids, *Chaetopsila elegans* and *Lariophagus calandrae,* which kill the larvae of *Rhizopertha dominica, Calandra oryzae* and *C. granaria.* They cannot, however, exterminate the weevils; both parasites and pests survive for an indefinite time in infested wheat, the balance being maintained by an Acarid that attacks the parasites.

The work of the Committee has demonstrated that the whole subject of grain pests is of serious importance to the Empire, and that it is advisable that a permanent organisation should be created to deal, not only with insect pests, but with all living organisms causing destruction to vegetable food-stuffs. The Committee has therefore drawn up and submitted to the Council of the Royal Society a report suggesting the future organisation of grain-pest work in the British Isles. It is recommended that the State should assume general responsibility for the continuance of the work, and that it should be divided into the sections dealing with intelligence, research and education. A scheme is suggested as indicating a possible nucleus organisation to deal with the work.

Priesner (H.). **Kurze Beschreibung neuer Thysanopteren aus Österreich.**—*Sitzungsber. Akad. Wiss., Vienna,* Abt. 1, cxxix, pt. 1–2, 1920, pp. 71–87, 8 figs.

The eleven new species described include *Parafrankliniella verbasci,* gen. et sp. n., occurring in June and September on leaves and blossoms of *Verbascum thapsus* and *V. nigrum,* also in company with *Neoheegeria verbasci,* Osborn; *Thrips difficilis* on fading willow catkins; *T. robustus* in May and July on blossoms of *Gentiana kochiana* and *G. clusii* at an elevation of about 5,000 feet above sea-level; *T. alpinus* on various species of *Gentiana,* especially *G. clusii; Haplothrips vuilleti* on blossoms of *Trifolium montanum* and *Anthyllis jacquini; H. arenarius* on *Helichrysum arenarium;* and *Eurytrichothrips piniphilus,* gen. et sp. n., occurring under loose scales of the bark of conifers.

Heikertinger (F.). **Bestimmungstabelle der Halticinengattung** *Psylliodes* **aus dem paläarktischen Gebiete mit Ausschluss Japans und der Kanarischen Inseln.** [A Key to the Halticine Genus *Psylliodes* from the Palaearctic Region, excluding Japan and the Canary Islands.]—*Koleopt. Rundschau, Vienna,* ix, no. 1–3, 30th March 1921, pp. 39–48.

The title of this systematic paper indicates the nature of its contents.

Paoli (G.). **Considerazioni sui Rapporti biologici fra le Cavalette ei loro Parassiti oofagi.** [Considerations on the biological Relations between Locusts and their oophagous Parasites.]—*Riv. Biologia, Rome,* ii, no. 4, July–August 1920, pp. 387–397. [Received 1st July 1921.]

The work here described was carried on for three years at Foggia to ascertain why the oophagous enemies of *Dociostaurus maroccanus*, Thunb., are not so efficient as their numbers would warrant.

In Italy the locust eggs are destroyed by a Mylabrid beetle, *Mylabris* (*Zonabris*) *variabilis*, and by two Bombyliid flies, *Systoechus ctenopterus* and *Mulio obscurus*. These parasites do not interfere with each other, and their biology is similar in many ways. In the summer each newly hatched larva enters a recently deposited egg-case and begins feeding on the eggs. At the end of the season or early in autumn it emerges from the egg-case and burrows into the ground. (In the case of *Mylabris* the larva hibernates as a pseudo-pupa, becoming mobile again in the spring.) It rises to the surface in the spring, pupates and transforms into the adult.

The adults appear in the areas in which the locust eggs were laid in the preceding year shortly after dispersal of the locusts of the current year. They obtain their food from flowers, in search of which they gradually scatter. The locusts remain in dense swarms, and though they always meet with some enemies, the latter are much more widely distributed.

Locust outbreaks are the outcome of a progressive increase during a series of years, and their termination is due to a considerable extent to these oophagous enemies and others.

M. variabilis can parasitise other locusts, such as *Calliptamus italicus*, besides *D. maroccanus*, and this seems to apply to the two Bombyliid flies also. Moreover, some of the individuals of the three parasites remain in the larval stage for longer than a year. Owing to these circumstances the preservation of their species is assured.

The percentage of parasitised egg-cases may vary considerably within a distance of a few score yards, but the author's estimate is 25–30 per cent. for 1917, while of 5,659 egg-cases examined in 1919, 27·9 per cent. were parasitised.

Other estimates show wide variations, such as from 5·6 to 73·3 per cent. in one and the same zone. In a given area the high percentages occur where the egg-cases are few. The general parasitism diminishes as the distance from the original centre of the parasites increases.

As these observations refer to indigenous insects, the service they render cannot be increased artificially. The only possible way of decreasing the number of locusts by means of oophagous enemies would be by the introduction of such enemies from other countries. The following are some of the species: in Algeria, a Bombyliid fly,

Anthrax fenestratus, and a Mylabrid beetle, *Mylabris* (*Zonabris*) *schreibersi*; in south Russia, 20 species of *Mylabris*, 4 Meloid beetles, *Epicauta* spp., and 3 Bombyliids, *Mulio obscurus*, *Anastoechus nitidulus* and *Callostoma desertorum*; in Asia Minor, *Callostoma fuscipenne*; in North America, the Meloid beetles, *Epicauta vittata* and *Lytta cyanipennis*, and the Bombyliids, *Systoechus oreas* and *Aphoebantus mus*.

Of 2,443 parasite larvae noticed at Foggia in 1917 *Mylabris* was represented by 21 per cent., *Mulio* by 40, and *Systoechus* by 39; in the following year 24 per cent. of 1,197 larvae were those of *Mylabris*, while the Bombyliids accounted for the remainder.

Masi (L.). **Chalcididae raccolte in Cirenaica dal Dott. V. Zanon.** [Chalcids collected in Cyrenaica by Dr. V. Zanon.]—*Ann. Mus. Civ. Storia Nat., Genoa* (3), ix, 9th March 1921, pp. 168–193, 7 figs. [Received 2nd July 1921.]

The Chalcids collected in Cyrenaica by Dr. Vito Zanon include the following new species: *Paraholaspis* (gen. n.) *cothurnata*, *Zanonia* (gen. n.) *viridis*, *Philachyra cyrenaica*, *Eupelmella schizomyiae*, *Microterys berberus*, *Ericydnus metriocerus* and *Cerocephala eccoptogastri*; and also *Torymus chlorocopes*, Boh., *Dirrhinus hesperidum*, Rossi, *Bruchobius laticeps*, Ashm., and *Lariophagus calandrae*, How., which were already known from Europe.

Gautier (C.) & Reil (P.). **Complément de Description et Biologie d'*Apanteles rubecula*, Marshall (Hym. Braconidae), parasite de *Pieris rapae*, L. (Lep. Pieridae).**—*Bull. Soc. Ent. France, Paris*, 1921, no. 9, 11th May 1921, pp. 143–147.

The Braconid, *Apanteles rubecola*, Mshl., is recorded as a parasite of *Pieris rapae* in the Lyons district, and additional descriptions are given supplementary to those previously given in England. Observations show that the parasite always attacks the young larva shortly after it hatches, puncturing it several times, though more than one parasite never emerges from one host. *A. rubecola* can breed parthenogenetically and *P. rapae* is its exclusive host. In the Lyons district the development of the parasite is complete in 10 or 12 days. After another eight or nine days the adult emerges, the parasitised larva dying three or four days later.

Tetrastichus rapae, Wlk., occurs as a hyperparasite, and it is possible that it attacks the larva of *A. rubecola* through the larval skin of *P. rapae*.

Faes (H.) & Stachelin (M.). **Sur la Résistance du Hanneton adulte aux basses et hautes Températures.**—*C. R. Hebdom. Acad. Sci., Paris*, clxxiii, pt. 1, 4th July 1921, pp. 61–64.

As a result of experiments to determine the influence of cold and heat on cockchafers [*Melolontha*], it was found that they can resist the coldest temperature likely to occur in Lausanne. They burrow into the earth to escape the cold, and at or below 0° C. [32° F.] they freeze, but become active within an hour after removal from the cold chamber. Temperatures below −8° C. [17·6° F.] are fatal. They are apparently more susceptible to heat, as all individuals succumbed when exposed to a temperature of 45° C. [113° F.] for eight hours.

Sicard (H.). **Action de la Bouillie bordelaise au Pyrèthre et de la Bouillie bordelaise nicotinée appliquées en Traitements curatifs contre la première Génération d'Eudémis.**—*Progrès Agric. & Vitic., Montpellier,* lxxvi, no. 27, 3rd July 1921, pp. 10–11.

Tests of the exact value of a combination of Bordeaux mixture and pyrethrum against the first generation of *Polychrosis botrana,* Schiff., were made by comparing the effect of 2 gals. of pyrethrum-soap solution to 18 gals. of Bordeaux with that of 1 pint of nicotine extract (containing 50 per cent. of alkaloid) to 46 gals. of Bordeaux. The mixing is rapid and the solutions were applied immediately.

It was found that the mortality among the caterpillars was 92 per cent. for the pyrethrum mixture and 60 for the nicotine mixture, thus confirming last year's conclusions [*R.A.E.*, A, viii, 369].

Hubert (A.). **Quelques Essais de Traitement de la Cochylis.**—*Progrès Agric. & Vitic., Montpellier,* lxxvi, no. 27, 3rd July 1921, pp. 12–14.

This paper deals with *Polychrosis botrana,* Schiff., as well as with *Clysia ambiguella,* Hb.

The author has obtained unsatisfactory results with the pyrethrum-soap spray used in moderate quantities, and suggests that the price does not permit the abundant applications that seem necessary. It is possible that a 3 per cent. solution of soap may give as good a result.

Trials with a commercial fluid bait of secret composition, and also with strings dipped in a phosphorescent adhesive intended to attract moths flying close by, were unsuccessful.

All three methods seem worthy of further investigation, as modifications may result in making them valuable.

Faes (H.). **L'Action du Savon-Pyrèthre sur les Chenilles de Cochylis et d'Eudémis.**—*Progrès Agric. & Vitic., Montpellier,* lxxvi, no. 29, 17th July 1921, p. 68.

Referring to the two preceding papers the author, who is chief of the Swiss federal viticultural experiment station at Lausanne, agrees *in toto* with the results obtained by M. Sicard, and suggests that the non-success of M. Hubert may be due to the pyrethrum used by the latter being in some way faulty. A soap solution by itself does not give the same highly satisfactory results. Pyrethrum-soap kills 90–100 per cent. of the caterpillars of *Polychrosis botrana,* Schiff., which are even more sensitive to it than those of *Clysia ambiguella,* Hb.

Gondé (H.). **La Mouche des Asperges en Loir-et-Cher.**—*Jl. d'Agric. Pratique, Paris,* xxxvi, nos. 26 & 27, 2nd & 9th July 1921, pp. 13–14, 35–36, 8 figs.

In Loir-et-Cher, where about 4,500 acres are under asparagus, the asparagus fly, *Platyparea poeciloptera,* is noticed with early asparagus in April and continues until June. It oviposits at the base of the scales, and those eggs hatch that are deposited on the heads that are not picked, *i.e.*, on beds less than four years old or on plants kept for seed. After mining the head the maggot pupates within it, the adult appearing in the following spring.

The plants may be covered with leaves or shields, made by stretching cloth or translucent paper on a skeleton box. The adult flies may be collected in the morning by hand, or with a tarred screen, and this prevents much damage. Measures against the maggots are not feasible, but the pupae may be destroyed by uprooting and burning infested stems. This must be done before they rot, and no dead stems must be left in the ground after November. The uprooted stems should be stored for some time away from rain so as to ensure complete combustion, and burnt, with all debris from old beds, before 20th March. Co-operation is essential, and in Loir-et-Cher a subsidy up to 40 per cent. of the cost is available.

Contra la Mosca del Olivo. [Measures against *Dacus oleae.*]—*Rev. Inst. Agric. Catalán S. Isídro, Barcelona,* lxx, no. 6, June 1921, pp. 107–110.

A publicity campaign has been organised in Catalonia for making known the measures required against the olive fly [*Dacus oleae*]. A circular distributed in connection with this work describes the well-known methods of Berlese and of Lotrionte for combating this pest. The Lotrionte formula for the poison-bait is slightly modified to read as follows: Molasses 50 lb., anhydrous sodium arsenite 2 lb., boric acid 2 lb., borate of soda 2 lb., water up to 10 gals. The Berlese formula has also been modified, the one recommended being: Water 10 gals., sodium arsenite 5 oz., molasses 15 lb.

CAMACHO (C.). **El Chape del Cerezo** (*Eriocampoides limacina*).—*Serv. Policia Sanit. Vej., Santiago de Chile,* 1917, 8 pp., 5 figs. [Received 4th July 1921.]

Eriocampoides limacina (cherry slug) has become increasingly abundant in recent years on cherries, plums, pears and other Rosaceous trees. The insect was first observed in the south of Chile, and is gradually spreading each year farther north. Descriptions of the stages of the insect are given and its biology is discussed. The appearance of the first generation is very irregular, as the climatic conditions vary so greatly in different parts of Chile. In Santiago, however, there are undoubtedly two generations a year, for newly hatched larvae have been found in March, while the adults producing the first generation appear in the central zone from late November to early January. The usual Paris green and lead arsenate sprays are recommended. As a long period is spent underground, cultivation of the soil around the trees should be maintained, particularly in the autumn and early spring, in order to expose the pupae.

Funjicidas e Insecticidas mas usados para combatir las Enfermedades de las Plantas.—*Serv. Policia Sanit. Vej., Santiago de Chile,* 5th Edn., 1918, 19 pp. [Received 4th July 1921.]

This paper indicates the various kinds of diseases to which plants are liable and the different classes of insects that attack them. Suitable sprays for each class are recommended, with formulae and instructions for preparation.

CAMACHO (C.). **El Gusano del Poroto** (*Pegomyia chilensis*).—*Serv. Policia Sanit. Vej., Santiago de Chile*, 1918, 7 pp., 3 figs. [Received 4th July 1921].

Growers of beans in Chile frequently find it necessary to re-sow a large part of their crop, on account of infestation by *Pegomyia chilensis*, which destroys many of the seeds, preventing them from germinating, or causing the young plants to wilt and die as soon as they appear above ground. Eggs are laid either on the seed or on the seedlings, which are then attacked by the larvae. The destruction of these subterranean insects is difficult ; substances used to sterilise the soil are very expensive and are apt to injure the plant more than the insect. Plants that show signs of infestation should be pulled up carefully, so that the larvae come with them and can be destroyed. As a preventive measure, a bucketful of fine sand should be well shaken up with a cupful of paraffin and spread around the base of the plants. Another method is to prepare a phenic acid emulsion by dissolving 1 lb. of soap in 2 gals. of water and then adding 5 lb. of crude phenic acid until an emulsion is formed. This must be diluted with 25 parts of water before use. It has been observed that infestation is worse in soil in which organic manure is used, as the flies are attracted by the decomposing matter, while minerals act as repellents—particularly saltpetre and potassium salts. The use of a roller over the ground just after sowing would probably prevent oviposition to some extent.

Algunos Insectos perjudiciales á las Arvejas, Frejoles, Lentejas y otras Legumbres y Brucos del Trebol. [Some Insects injurious to Vetch, Beans, Lentils and other Vegetables, and Clover Bruchids.]—*Serv. Policia Sanit. Vej., Santiago de Chile*, 1919, 28 pp., 13 figs. [Received 4th July 1921.]

An account is given of the Bruchids commonly found attacking vetch, beans, lentils, etc., both when growing and in storage. *Bruchus pisorum*, L., is the only one as yet recorded from Chile, where 14 per cent. of germination has been found to be the rule in large varieties of vetch and 0 per cent. among the small varieties of seed, such as the petit-pois, which are chiefly used for preserving. There is only one generation in a year. As breeding does not take place in the granary, infestation in a second year arises from insects surviving in the seeds, or that have remained in the field or escaped from a granary where infested seed has been stored. A simple remedy is to keep the seed in a tightly closed vessel ; the insects die in this, and the damage is limited to that of the larvae in the first year. Late sowing considerably reduces the damage. If seed must be sown early and in the first year after gathering it should be fumigated with carbon bisulphide, or the storehouse heated during the winter, as explained below. It is suggested that the parasite, *Pteromalus varians*, should be introduced from France.

Clover Bruchids occurring in Chile include *Bruchus leguminarius*, Schoenh., *B. leucogaster*, Blanch., and *B. elegans*, Blanch. There is one generation of these in a year, infestation occurring in the field, where the females oviposit on the flowers. The larvae penetrate the seed, and the insect remains within until harvest-time, when the adults begin to appear, and generally survive in the storehouses until the following spring, when they continue reproduction in new clover.

Many of the insects are left in the debris remaining after the seed is cleaned ; this should therefore be burnt to destroy them. The seed should be disinfected a fortnight or a month after the harvest. This is done by tightly closing the storehouse and heating to a temperature of 65° to 70° F., which must be maintained for a week. This causes the insects within the seed to develop and emerge prematurely, especially if the seed be stirred. The building should then be fumigated with 2 lb. carbon bisulphide per 700 cu. ft. of space, and left closed for five days, after which it may be ventilated and the dead insects separated from the seed.

Los Trips del Palto y de la Cebolla. [Thrips of the Avocado Pear and Onion.]—*Serv. Policia Sanit. Vej., Santiago de Chile,* 1919, 10 pp., 7 figs. [Received 4th July 1921.]

Heliothrips haemorrhoidalis is a well-known pest of greenhouses and of many outdoor plants in Europe. In Chile it was observed in 1915 in greenhouses where azaleas, rhododendrons, heliotrope, and other delicate plants were being grown. It is now a pest of considerable importance on avocado pear and lemon trees. It increases with extreme rapidity, and on badly infested trees causes the leaves to drop and the fruit to remain undeveloped or become defective.

The remedy suggested is a paraffin emulsion, made of 12 oz. soap in 1 gal. boiling water, to which 1 gal. paraffin is added. A further 14 gals. water is then added and the paraffin well mixed in. For very young or delicate plants, a decoction of tobacco should be prepared by heating 100 gals. water and adding at the moment of boiling 30 lb. tobacco or tobacco dust and 2 lb. carbonate of soda. This should be boiled for half to three-quarters of an hour and strained through a cloth. Calcium polysulphide (15°Bé.) is then mixed with water in the proportion 1½ gals. to 10 gals. water, and 2½ lb. iron sulphate in another 10 gals. of water. These two mixtures are stirred together and a paste of 4 lb. flour to 10 gals. water is mixed in. The tobacco decoction is then added and the whole is ready for use. Applications should not be made in strong sunlight.

Thrips tabaci does considerable damage to onions, grasses, garden plants and also fruit trees. It is quite numerous on apple trees, on the foliage and at the base of the fruit. Among trees kept under observation, one that was not treated lost almost all its fruits, those that were more than half developed falling, while in neighbouring trees that were treated in time the fall of fruit was checked in a few days. The leaves when punctured show small white marks and later turn yellow and wither. The remedy suggested is an emulsion of 2 gals. paraffin in 3 gals. water containing 1¾ lb. soap, to which is added 100 gals. of the tobacco decoction described above.

FIGUEROA (C. S.). **Mariposas perjudiciales. Las Polillas de la Papa.** [Injurious Moths. The Pests of Potatoes.]—*Serv. Policia Sanit. Vej., Santiago de Chile,* 1920, 10 pp., 6 figs. [Received 4th July 1921.]

Two important potato pests in Chile are the Microlepidoptera, *Gelechia galbanella*, Z. [probably *Phthorimaea operculella*, Z.] which is known in many countries as an enemy of the potato, and *Trichotaphe tangolias*, K. v. G., which is a purely Chilian species, and more abundant than the former. These two pests are increasing in

numbers each year, destroying an average of 25 per cent. of the crop. The various stages of both moths are described. Their life-history and the injury they cause are so nearly identical that it is almost impossible to tell which insect is responsible for the damage.

The first moths appear in the potato fields about the middle of September, being active at night and remaining hidden by day. Eggs are laid on the leaves or tender shoots of potato plants, or directly on the tubers if these are exposed. The young larvae first feed on the green part of the plant and then descend to the tubers, in which they construct galleries, from which they issue when mature to pupate under some slit in the skin of the tuber, the adults appearing about 20 days later. In the southern and central Provinces there are as many as three generations during the spring and summer, but in the north, where the climate is warmer, all stages of the insect may be found at any time. The injury is two-fold, in the field, and in storage, where breeding and destruction of the tubers continues.

There is no one decisive remedy for these insects, and several methods have to be used in conjunction to reduce the infestation within reasonable limits. Land that is required for potatoes should be cleared of all weeds, especially wild Solanaceous plants that might harbour the insects, and should be kept clear for as long as possible before planting with potatoes. During the growth of the plants the soil should be kept cultivated and free from weeds, and any plants that show signs of infestation should be at once taken up and burnt. In places where potatoes have been cultivated for a number of years and where the moths have been breeding unchecked, rotation of crops should be practised, all Solanaceous plants being dug up, and cereals, beans, melons, lucerne, clover, etc., substituted for a year or two. The soil should be kept very fine and without lumps, as neither larvae nor adults can make their way easily through such ground to the tubers. The plants should be well hilled up so that the tubers are not exposed. Before taking up the crop, all dried-up plants should be pulled out and laid in piles along the lines. A day or two later, early in the morning, these piles should be burnt. Larvae, pupae and adults all shelter under these piles and may thus be destroyed. After the crop is up, it should be removed as quickly as possible in order to avoid infestation by the adults that have survived. Before storage, any affected tubers should be separated and either destroyed or boiled at once and used as food for stock. When the crop is to be kept during the winter or to be used as seed it should be inspected again two weeks after gathering and should be stored in a well ventilated building, all openings being screened by fine wire mesh. Storehouses that are found to be infested should be disinfected with carbon bisulphide used at the rate of 2 lb. per 20 cu. ft. of space. This process should be repeated at least once after a two weeks' interval. As the moths are attracted to lights, an acetylene lamp set in a wide, open receptacle makes an excellent trap either in the field or storehouse.

Las Cuncunillas.—*Serv. Policia Sanit. Vej., Santiago de Chile,* 1921, 8 pp., 12 figs. [Received 4th July 1921.]

Cutworms occur every year in the gardens, fields and orchards of Chile, but it is only under unusual circumstances that they become serious pests. The most important species are *Cirphis* (*Leucania*) *unipuncta* and *C.* (*L.*) *impuncta*, on lucerne and pasture grasses:

Phytometra (*Plusia*) *nu*, on beans, pastures, etc. ; *P. biloba*, on lucerne, pastures, etc. ; *Lycophotia margaritosa* (*Peridroma saucia*), on potatoes, pastures, etc. ; *Agrotis ypsilon*, on potatoes, beans (pulse), chick-peas, etc. ; *Heliothis* (*Chloridea*) *obsoleta*, on maize, chick-peas, tomatos, etc. ; *Copitarsia consulta*, on lucerne, pastures, tobacco, etc. ; *Feltia annexa*, on vines, potatoes, beans, etc., and *F. subgothica*, on maize, beans and various grasses and pasture plants. The most important natural enemy of these cutworms is the Carabid, *Calosoma vagans*. The remedial measures include autumn ploughing, the construction of ditches to prevent migration, rolling the ground while the insects are feeding above the surface, and flooding. The usual arsenical mixtures and poison baits are also recommended.

CAMACHO (C.). **La Cochinilla Negra del Olivo,** *Saissetia* (*Lecanium*) *oleae*, **Bern.**—*Serv. Policia Sanit. Vej., Santiago de Chile*, 1917, 2 pp., 1 plate. [Received 4th July 1921.]

Saissetia oleae, Bern. (black citrus scale) occurs abundantly on olive and citrus trees in Chile, and also on almonds, plum, magnolia, camellia, rose and other fruit, forest and ornamental trees, as well as on garden plants. All stages of the scale may be found together, and in the northern and central parts of the country eggs and larvae are found practically all the year round, though in spring and early summer they are at their maximum numbers. A description of the stages and the life-history are given. Paraffin emulsion and calcium polysulphide have both yielded good results against the scale in Chile ; the preparation of these is described.

PICARD (F.). **Le déterminisme de la Ponte chez un Hyménoptère térébrant, le** *Pimpla instigator*, **L.**—*C. R. Hebdom. Acad. Sci., Paris*, clxxii, pt. 25, 20th June 1921, pp. 1617–1619.

The stimulus to oviposition and behaviour of the adults of *Pimpla instigator*, L., are discussed.

TANQUARY (M. C.) & HAYS (M. E.). **Commercial-Sulphur Products as Dormant Sprays for Control of the San José Scale.**—*Texas Agric. Expt. Sta., College Station*, Circ. 24, November 1920, 7 pp., 2 figs. [Received 6th July 1921.]

An account is given of experiments in the control of San José scale [*Aspidiotus perniciosus*] with certain commercial preparations of lime-sulphur in the dry form that are being offered in view of the difficulties of preparing the home-made mixture and the expense and trouble of handling the stock solution. The mixtures used were Niagara soluble sulphur, Sherwin-Williams dry lime-sulphur, and Grasselli liquid lime-sulphur, and all were very effective under the conditions of the experiment. Further tests should be made before final recommendations can be made, but the possibility of success with such preparations against San José scale is clearly demonstrated.

TANQUARY (M. C.) & REINHARD (H. J.). **Dusting Cotton for the Control of the Boll-weevil.**—*Texas Agric. Expt. Sta., College Station*, Circ. 29, April 1921, 9 pp., 1 fig.

The dusting method for the control of the cotton boll-weevil [*Anthonomus grandis*], as developed by Coad [*R.A.E.*, A, viii, 457], has proved successful under Texas conditions. A list of precautions intended as a guide for those proposing to adopt this method is given.

SWENK (M. H.). **The Harlequin Cabbage Bug.**—*Nebraska State Ent., Lincoln,* Bull. 10, 24th July 1920, 3 pp., 2 figs. [Received 6th July 1921.]

Serious injury was caused to cabbage and other cruciferous crops in Nebraska in 1920 by *Murgantia histrionica.* Its life-history is briefly outlined and remedial measures are advocated [*R.A.E.*, A, v, 388]. A 10 per cent. kerosene emulsion will destroy the nymphs; against the adults a spray consisting of 1 U.S. pt. nicotine sulphate to 25 U.S. gals. of water (1 to 200) and 4 lb. of soap may produce good results.

BEESON (C. F. C.). **The Food Plants of Indian Forest Insects, Part vi.**—*Ind. Forester, Allahabad,* xlvii, no. 6, June 1921, pp. 247–252.

This continuation of lists previously noticed [*R.A.E.*, A, ix, 187] deals with the Scarabaeids:—*Heterorrhina mutabilis,* Hope, on *Glochidion* sp.; *Protaetia neglecta,* Hope, on *Mallotus philippinensis* and *Cedrus deodara*; *Oryctes rhinoceros,* L., on *Borassus flabelliformis, Cocos nucifera, Oreodoxa regia, Phoenix sylvestris* and other palms; *Xylotrupes gideon,* L., on *Poinciana regia*; *Apogonia clypeata,* Moser, on teak; *A. granum,* Burm., on teak; *Autoserica insanabilis,* Brenske, on teak, *Citrus medica* and sugar-cane; *Brahmina coriacea,* Hope, on *Desmodium tiliaefolium, Ficus carica,* pear, apple, *Spiraea sorbifolia* and *Vitis* sp.; *Holotrichia intermedia,* Brenske, on *Cryptomeria japonica*; *H. longipennis,* Blanch., on *Quercus incana* and *Rubus lasiocarpus*; *H. problematica,* Brenske, on *Eugenia jambolana, Shorea robusta* and *Terminalia belerica*; *H. tuberculata,* Moser, on teak; *Lepidiota bimaculata,* Saund., on *Shorea robusta*; *Leucopholis pinguis,* Burm., on *Erythrina* sp., *Cinnamomun zeylanicum, Coffea robusta* and *Hevea braziliensis*; *Adoretus bimarginatus,* Ohaus, on *Bombax malabaricum*; *A. caliginosus,* Burm., on *Dalbergia sissoo*; *A. epipleuralis,* Arrow, on teak; *Anomala dalbergiae,* Arrow, on *Dalbergia latifola*; *A. dimidiata,* Hope, on *Berberis* sp., *Crataegus* sp., *Butea frondosa,* pear, apple, and *Rubus ellipticus*; and *A. lineatopennis,* Blanch., on plum, *Aesculus indica* and *Quercus* sp.

STEWART (F. H.). **The Anatomy and Biology of the Parasitic** *Aphelenchi.*—*Parasitology, Cambridge,* xiii, no. 2, June 1921, pp. 160–179, 1 plate, 32 figs.

The species dealt with are: *Aphelenchus fragariae,* R. B., *A. olesistus,* R. B., and *A. phyllophagus,* sp. n. The first of these Nematodes causes the disease known as strawberry bunch, the other two cause leaf disease in flowering plants and ferns. The definitive habitat of *A. fragariae* is in the stem and leaves of the strawberry plant, whilst that of *A. olesistus* and *A. phyllophagus* is in the mesophyll spaces of the leaves of many plants. Nutrition and reproduction are most actively carried on in this situation, many generations succeeding each other. As the diseased leaves fall, the adults and larvae reach the soil and enter upon the resting stage, the adults surviving in a partly dried dormant condition on the surface of the soil for prolonged periods. When revived by moisture and attracted to a suitable plant they migrate to it and may live for some time as ectoparasites in the leaf axils, etc., before entering the definitive habitat. Eggs may be laid in the leaf axil, the larvae migrating to the definitive

habitat. The mesophyll spaces are reached through the stomata. This life-cycle is that of the race and not the individual. The complete embryonic and larval development of the individual does not require more than 10 days, and the life-cycle from egg to egg may be completed in 14 days. High humidity assists migration, but is not essential to it.

Infested plants and leaves should be burnt, and the use of infected surface soil for boxes and pots should be avoided. The parasites may be killed by immersing the plants in water heated to 50–52° C. [122–126° F.] for five minutes. Exposure to dry atmosphere saturated with carbon bisulphide for 24–48 hours kills the parasites, but affects the appearance of almost all plants.

SICARD (—). **Descriptions d'Espèces et Variétes nouvelles de Coccinellides de San Thomé.**—*Bull. Soc. Portug. Sci. Nat., Lisbon,* viii, pt. 3, 1920, pp. 211–214. [Received 7th July 1921.]

The species described are *Endochilus plagiatus,* sp. n., *Chilocorus pilosus,* sp. n., *Exochomus nigromaculatus,* Goez. v. *insulicola,* n., and *Rodolia seabrai,* sp. n.

MÜLLER-THURGAU (—). **Zur Bekämpfung des Heu- und Sauerwurms mit arsensaurem Blei (Bleiarsenat).** [The Use of Lead Arsenate against the first and second Generations of *Clysia ambiguella* and *Polychrosis botrana.*]—*Schweiz. Zeitschr. f. Obst.- u. Weinbau, Frauenfeld,* xxx, no. 13, 2nd July 1921, pp. 198–200.

Lead arsenate should only be used for spring spraying against vine-moths and should be prohibited in July and August on the bunches. Nicotine, which is the substitute in the later work, has many disadvantages; it delays ripening and tends to confer a disagreeable flavour. It may, perhaps, be possible to use Paris green or sodium arsenate. The latter gave good results in a small trial at Wädenswil.

GOWDEY (C. C.). **Economic Entomology.**—*Jl. Jamaica Agric. Soc., Kingstown,* xxv, nos. 2, 3, & 4–5, February–May 1921, pp. 65–69, 113–118, 156–161.

The lectures delivered at a course for Agricultural Instructors in Jamaica, in January 1921 are here given. Their main object was briefly to point out the chief principles of insect life, and to apply this knowledge to the control of insect pests. The various control methods, poison sprays and contact insecticides, with directions as to use, are described.

EHRHORN (E. M.). **Division of Plant Inspection.**—*Hawaiian Forester & Agriculturist, Honolulu,* xviii, no. 3, March 1921, pp. 67–68. [Received 7th July 1921.]

The pests intercepted in February 1921 included *Argyresthia cupressella* on cypress trees from California and a Hemipteron among seeds of *Ficus* from the Philippine Islands.

SMITH (L.). **Report of the Virgin Islands Agricultural Experiment Station, 1919.**—*Washington D.C.,* 5th November 1920, 16 pp. 4 plates. [Received 8th July 1921.]

The principal industries of the American Virgin Islands and the work of the station during the year 1919 are reviewed and described.

Soil grubs, particularly *Strategus titanus*, infesting sugar-canes have been successfully controlled by handfuls of bagasse, mixed with Paris green, inserted in the soil at regular intervals of 5 feet apart. This mixture can also be added to manure spread on the land, or inserted in holes after the cane has been planted.

The experimental planting of varieties of cotton in 1918 was unsuccessful owing to the continuous rainy weather; the fields were overrun with noxious plants, and immense numbers of cotton worms [*Alabama argillacea*] appeared. Progress was made in experiments to produce varieties of cotton resistant to or immune from the blister mite [*Eriophyes gossypii*].

Careful observations were made to determine whether maize grown on cane banks would be more liable to cane-borer attacks, but no ill effects were noticed.

Some Hopi maize obtained from Washington for hybridising purposes, when planted on two occasions, succumbed to attacks by *Dicranotropis maidis*. This insect is the worst maize pest in the islands, and as it has other food-plants than maize it is difficult to recommend any remedial measures. Acclimatised maize is more resistant than newly introduced varieties; but all kinds, if planted during the dry months, are liable to be killed by this pest.

Corn-ear worms [*Heliothis obsoleta*] often eat the hearts of young maize plants, but in favourable weather they outgrow the attacks. A pinch of corn meal containing 5 per cent. lead arsenate placed in the heart of each plant will kill the larvae.

In leguminous crop trials made during the year it was found that *Phaseolus lunatus* (Madagascar bean) and *Canavalia* beans were not attacked by caterpillars. *Andropogon sorghum sudanensis* (Sudan grass) is not recommended for extensive planting as it harbours the sorghum midge [*Contarinia sorghicola*].

SMITH (L.). **Work at St. Croix Station.**—*Rept. Virgin Islands Agric. Expt. Sta., 1920, Washington, D.C.*, 18th April 1921, pp. 7–20, 4 plates.

Experiments in the control of soil grubs infesting sugar-cane were continued [see preceding paper], a field being treated with 3 parts of Paris green to 100 parts of bagasse, every 6 feet apart; but the results cannot be published until the harvest of 1921.

The cotton yield was not so good as in 1919, and in one instance this was due to an early outbreak of *Eriophyes gossypii* (blister mite) as the result of imperfect uprooting and burning of old cotton in a neighbouring field. It is urged that the cotton pest law be more thoroughly carried out. One variety of cotton produced was practically immune from *E. gossypii*; but the third largest yield was obtained from a variety that was heavily attacked.

No variety of edible legumes gave satisfactory results except for green manuring purposes. The poor yield was due to a kind of anthracnose spread by *Nezara viridula* (green stink bug).

Euscepes batatae (sweet potato weevil) infesting sweet potatoes was successfully controlled by dipping the cuttings in kerosene-fusel oil emulions before planting, which killed any eggs laid on the vines.

Beet was an uncertain crop, as it was attacked at times by *Pachyzancla bipunctalis* (webworm).

WILSON (C. E.): **Report of the Entomologist.**—*Rept. Virgin Islands Agric. Expt. Sta. 1920, Washington, D.C.,* 18th April 1921, pp. 20–35, 2 tables.

The names and food-plants of scale-insects collected in the American Virgin Islands are given in a table.

Kerosene-fusel oil emulsion [*R.A.E.*, A, v, 397], unlike other contact insecticides, requires no heat when mixing, and in the West Indies fusel oil is cheap. Scales of the subfamilies DACTYLOPIINAE and COCCINAE were killed with one part diluted with 15–20 parts water. One part with 10 parts water was successful in killing scales of the subfamily DIASPINAE; *Euscepes batatae* (West Indian sweet-potato weevil); *Heliothrips rubrocinctus* (red-banded thrips), attacking *Mangifera indica* (mango tree); and *Targionia hartii* (yam scale) infesting yam tubers, which were immersed in the solution before planting.

Owing to the increasing numbers of *Aleurodicus cocois* and *Aleurothrixus floccosus* (whiteflies), the red fungus, *Aschersonia aleurodis*, was introduced as a control measure. The introduction was unsuccessful, owing to high winds and drought, but it will be resumed with the establishment of windbreaks. In the larval stage a small Coccinellid beetle (*Exoplectra* sp.) attacked *A. cocois*.

Sugar-cane was infested with *Diatraea saccharalis* (sugar-cane moth borer). The tunnels of larvae in the stalk permit the entrance of fungi, and cause direct loss in sugar and reduction in purity of juice. Parasitic and predaceous insects and the fungus *Cordyceps barberi* partly control the larvae. Other measures recommended are: planting non-infested cuttings, clean cultivation, collection of egg clusters, cutting out dead hearts, and burning all infested canes.

The most injurious sugar-cane pests in 1920 were *Metamasius sericeus* and *Lagochirus araneiformis*. All dead canes should be burnt. A table is given of the damage caused by each of these pests.

Pseudococcus calceolariae and *P. sacchari* are controlled by natural enemies and a parasitic fungus, probably *Aspergillus flavus*. Young canes are seriously damaged by the root grubs, *Ligyrus* sp. and *Strategus titanus*, probably introduced in bagasse and pen manure. *Targionia sacchari* caused only slight damage. *Xyleborus* sp. (shot-hole borer) attacked diseased canes, which should be collected and burned.

Cotton pests include *Nezara viridula* (green stink bug) and *Dysdercus andreae* (cotton stainer). Hand-picking, or knocking them into water containing a film of kerosene, is recommended, and *D. andreae* may also be trapped by placing handfuls of cotton seed every 15 or 20 ft. between the rows. Against *Eriophyes gossypii* (blister mite) the control method is a close season, regulated by the Cotton Pest Commission, when no planting is done or old plants allowed to remain. Aphids attacking cotton are controlled by parasitic and predaceous insects and a fungus, probably *Acrostalagmus albus*. Kerosene emulsion will control scale-insects if necessary. The larvae of *Alabama argillacea* (cotton worm) are the most serious cotton pest, as they defoliate the plants. Their presence can be detected by the odour produced when feeding. The plants should be dusted with one part Paris green and eight parts air-slaked lime. This mixture also controls *Heliothis* (*Chloridea*) *obsoleta* (cotton bollworm). Other cotton pests are *Diaspis* (*Aulacaspis*) *pentagona* (West Indian peach scale), *Saissetia hemisphaerica* and *S. oleae* (black scale).

Insects severely attacked all maize. The chief pest is *Dicranotropis maidis* (corn leaf-hopper). The eggs are laid on the terminal leaves, which are sucked by the larvae, causing the plant to wither. Various contact insecticides, carbolineum, tobacco wash, and whale-oil soap-tobacco wash proved unsatisfactory, the latter alone showing possibilities.

Against *Heliothis obsoleta* (corn earworm) hand-picking and dusting with either equal parts air-slaked lime and arsenate of lead or one part Paris green to eight parts air-slaked lime are recommended. *Diatraea saccharalis* (stalk borer) infested stalks of mature maize ; all infested stalks should be destroyed after harvesting. A Syrphid, *Toxomerus politus* (?) and *Aphis maidis* (corn aphis) also attacked maize. The larvae of the former are found in the axils of the leaves and leaf-sheaths of the ears. The latter is controlled by parasitic and predaceous enemies.

The most injurious pest of sweet potatoes is *Euscepes batatae*. Sound sweet potatoes stored with infested tubers are attacked by weevils, but fumigation for 30 to 48 hours with 1 lb. carbon bisulphide for every 350 cu. ft. of space killed all stages of this pest.

Cryptotermes sp. was found working in the sills of houses. One part sugar to 20 parts white arsenic may be used as a poison bait, and creosote and tars as wood preservatives.

Batocera rubus was found damaging fig trees (*Ficus elastica* and *F. pedunculata*), mangos (*Mangifera indica*) and *Carica papaya*. The eggs of this insect are deposited in May and hatch in 48-72 hours. The larvae tunnel under the bark and into the soft wood. After seven or eight months they pupate. The adults emerge two or three months later, and feed on the leaves and branches.

The leaves of *Ricinus communis* (castor beans) were infested with *Corythuca gossypii*, and the stems with *Diaspis* (*Aulacaspis*) *pentagona*. These pests can be controlled by contact insecticides.

All vegetable crops were severely damaged by slugs (*Veronicella occidentalis*). Dropping fresh-cut vegetable leaves between the rows in the evening and destroying the slugs found the next day, sprinkling a small amount of air-slaked lime round the plants, and hand-picking at night were the remedial measures employed.

Beans were heavily infested with *Nezara viridula*. Owing to parasitic enemies *Eudamus proteus* (bean leaf-roller) caused no serious damage. One parasite (*Chalcis* sp.) is probably new. Beet leaves were webbed together and skeletonised by *Pachyzancla bipunctalis* (southern beet webworm). One part Paris green to eight parts air-slaked lime, or equal parts of lead arsenate and air-slaked lime, are recommended as a dust spray. The most serious pest of cabbages and kohl-rabi was *Plutella maculipennis* (diamond-back moth). The larvae skeletonise the leaves and retard the plant's growth. Dusting with one part Paris green to eight parts air-slaked lime, or spraying with 2 lb. Paris green, 6 lb. soap and 100 U.S. gals. water, are recommended. Slight damage was caused by *Pieris* (*Pontia*) *monuste* (southern cabbage butterfly) and *Aphis brassicae* (cabbage aphis), predaceous and parasitic enemies controlling the latter.

The larvae of *Diaphania hyalinata* (melon worm) seriously injured cucumbers, melons and squashes by defoliation and boring into the vines and fruit. Dusting with one part Paris green to 8–10 parts air-slaked lime, or equal parts lead arsenate and air-slaked lime, is recommended. Natural enemies controlled *Aphis gossypii*, attacking cucurbits.

Egg-plants and okra were attacked by *Pseudococcus virgatus*, *Pulvinaria urbicola*, *Saissetia hemisphaerica*, *S. oleae*, *Diaspis pentagona* and Aphids. A few specimens of *Diaprepes abbreviatus* were found on okra pods.

Tomatos were attacked by *Heliothis* (*Chloridea*) *obsoleta* (tomato fruit worm), *D. pentagona*, *Pulvinaria urbicola*, *Pseudococcus virgatus*, *Dysdercus andreae*, Aphids and *Nezara viridula*, which caused most damage by puncturing the blossom ends. Hand-picking is recommended as a control measure.

Stored grain and grain products were severely damaged by *Calandra granaria*, *C. oryzae* (grain weevils), *Pyralis farinalis* (meal snout moth) and *Plodia interpunctella* (Indian meal moth). The control measure used against these insects was fumigation with 1 lb. carbon bisulphide to 1,000 cu. ft. of space.

Notes on Insect Pests.—*Bur. Bio-Technology, Leeds,* Bull. 3, 1st June 1921, pp. 79–82.

Further cases of *Trogoderma khapra*, Arrow, infesting breweries in England are recorded. [*cf. R.A.E.*, A, ix, 143.] It was found in bran from the west of England associated with *Aleurobius farinae* and *Glyciphagus cadaverum*.

Monomorium pharaonis is recorded as destructive to sweetmeats in London.

Farm and garden pests mentioned are: *Ceuthorrhynchus sulcicollis*, Gyll., on cabbages; *Trombidium holosericeum* found in the vicinity of beans; *Melolontha melolontha* (*vulgaris*); Collembola; *Phyllobius oblongus* on apples and shrubs; *Pineas* [? *Pissodes*] *pini*, L., on conifer seedlings; *Aphis pruni* on plum trees; *Otiorrhynchus sulcatus* on flowering plants and vegetables; and *Aleurodes brassicae* on tomatos, cabbages and greenhouse plants.

Cunliffe (N.). **The Douglas Fir Aphis** (*Chermes cooleyi*, **Gill.**).—*Qtrly. Jl. Forestry, London,* xv, no. 3, July 1921, pp. 157–159.

Chermes cooleyi, Gill., was probably introduced into England from North America. It occurs on Douglas fir, but its economic importance cannot be accurately estimated until more is known of its life-history in this country [*cf. R.A.E.*, A, iv, 523; viii, 423]. In nurseries it may be controlled by nicotine soap wash or even strong soap wash alone, applied in the autumn.

Cunliffe (N.). **Defoliation of Spruce by Aphis** (*Myzaphis abietina*, **Walker**).—*Qtrly. Jl. Forestry, London,* xv, no. 3, July 1921, pp. 213–214.

Myzaphis abietina, Wlk., is recorded from Dorset on Sitka spruce. The trees were apparently growing on unsuitable soil. Contact insecticides are advocated for its destruction in nurseries [*cf. R.A.E.*, A, ii, 619]. The long-eared bat is predaceous on this aphid. It is noticed that in France the encouragement of bats is advocated as a protective measure against pine-shoot tortrices [*R.A.E.*, A, vii, 17].

Duport (L.). **Rapport sur les Recherches poursuivies à la Station Entomologique de Cho-Ganh.**—*Supplement to Bull. 129, Chambre d'Agric. Tonkin & Nord-Annam, Hanoi,* no. 10, September–October 1920, 2 pp. [Received 8th July 1920.]

Work in connection with the Braconid [*Doryctes strioliger*, Kieff.] parasitic on the coffee borer [*Xylotrechus quadripes*] has been continued,

230,000 individuals having been liberated. In several instances the Bethylid now recorded as *Sclerodermus domesticus*, Kieff. [*R. A. E.*, A, ix, 95], placed on the trunks of infested trees has successfully destroyed the borers.

MORSTATT (H.). **Die Schädlinge und Krankheiten der Kokospalme.** [The Pests and Diseases of the Coconut Palm.]—*Arb. Biol. Reichsanst. Land- u. Forstwirtsch., Berlin*, x, no. 3, 1920, pp. 195–242, 15 figs. [Received 8th July 1921.]

This list of enemies of coconut palms includes mammals, birds, insects and diseases. A brief description of the life-history and control of the more important insects is given, with the localities in which they occur and references to previous literature for further details.

MORSTATT (H.). **Die Schädlinge und Krankheiten der Sorghumhirse (Mtama) in Ostafrika.** [The Pests and Diseases of *Sorghum* in East Africa.]—*Arb. Biol. Reichsanst. Land- u Forstwirtsch., Berlin*, x, no. 3, 1920, pp. 243–268. [Received 8th July 1921.]

This paper collates information from various sources with regard to the pests of *Sorghum* in East Africa. The insect enemies of this crop here dealt with are: *Schistocerca peregrina*, Oliv.; *Zonocerus elegans*, Thunb.; *Conocephalus nitidulus*, Scop.; *Brachytrypes membranaceus*, Drury; *Gryllotalpa africana*, P.B., and *Gryllus* spp.; *Epilachna similis*, Thunb.; *Haltica* sp.; *Systates irregularis*, Fst.; the Noctuids *Sesamia nonagrioides*, Lef., and *Busseola sorghicida*, Thurau; the Pyralid, *Diatraea orichalcociliella*, Strand; *Lygaeus militaris*, F.; *Liburnia testacea*, Carlini; *Dicranotropis sorghi*; Jassids; *Aphis sacchari*, Zehnt., and *A. adusta*, Zehnt.

The pests of stored *Sorghum* are: *Calandra oryzae*, L., *Tribolium ferrugineum*, F., and *Sitotroga cerealella*, Oliv. Clean storage, fumigation and treatment by heat are advocated to prevent infestation. Seed intended for planting may be stored with 1 per cent. of naphthaline, but if treated in this manner it is not fit for food.

MORSTATT (H.). **Die wilden Seidenraupen in Ostafrika.** [The wild Silk worms in East Africa.]—*Arb. Biol. Reichsanst. Land- u. Forstwirtsch., Berlin*, x, no. 3, 1920, pp. 269–282. [Received 8th July 1921.]

A good deal of this information, especially with reference to *Anaphe infracta*, is quoted from previous authors, including Gowdey's papers: "Experiments on the Domestication of *A. infracta*, Wlsm.," in *Ann. Rept. Dept. Agric. Uganda*, 31st March 1911, and "On the Utilization of an Indigenous African Silkworm (*A. infracta*) in Uganda," in *Bull. Ent. Res.*, iii, 1912; also Dr. Schultze's paper on the silkworms of Africa, especially the social spinners, published by the African Silk Corporation [*cf.* also *R. A. E.*, A, ii, 530]. Some of the information has already been noticed [*R.A.E.*, A, ii, 547]. The present paper is chiefly concerned with the occurrence of the moths in Bukoba, East Africa, where *Anaphe infracta* has only been noticed by the author on *Bridelia* sp. The flight period of the main generation occurs from December to January, feeding takes place from February to June, and spinning from July to the end of October. The various periods of a minor parallel generation occur about six months ahead of the main one.

Other silkworms recorded from East Africa belonging to this genus are *A. panda*, Boisd., which is probably only a variety of *A. infracta*; *A. reticulata*, Wlk.; *A. ambrizia*, Butl., which according to Schultze is a synonym of *A. reticulata*, Wlk.; *A. venata*, Butl., found on a fruit tree (*Syzygium owariense*) and *Bridelia* sp.; and *A. dempwolffi*, Strand. *Diapalpus congregarius*, Strand, occurs on nearly all trees, especially acacias, *Ficus* spp. and Miombo trees, only the young trees of *Cassia florida* being free from nests. As many as 20 nests may be found on large trees. The feeding period of this species apparently coincides with the rainy season. There is only one generation in the year. *Oscinara signicosta*, Strand, occurs on mulberry and *Ficus warburgii*. The silk obtained from this species is considered to be nearly as valuable as that obtained from the true silkworm [*Bombyx mori*]. Other species recorded are the Saturniids, *Epiphora lugardi*, Kirby, and *Argema mimosae*, Boisd.

Brues (C. T.). **Correlation of Taxonomic Affinities with Food Habits in Hymenoptera with Special Reference to Parasitism.**—*Amer. Naturalist Lancaster, Pa.*, lv, no. 637, March–April 1921, pp. 134–164.

The various phases of parasitism as studied in the parasitic Hymenoptera are discussed, as is also the evolution of the characteristics of the various groups, due probably to natural selection and environmental factors.

Certain taxonomic groups of hosts are commonly attacked by certain distinct groups of closely related parasites; thus Alysiids are restricted to Dipterous larvae, Trigonalids to Vespids, *Polygnotus* spp. to Cecidomyiid larvae, and *Coccophagus* spp. to soft scales; but this order is not reversible. It would be difficult to find examples of groups of related hosts that are affected only by certain groups of parasites. This restriction of parasites to certain hosts is probably due to their failure to survive in any others rather than to an unvarying instinct of the adult.

As secondary parasitism is naturally dependent upon the primary form it must certainly be derived from the latter. The generally secluded and protected environment of the parasites probably acts regularly to make hyperparasitism an easily acquired characteristic. Numerous examples are quoted to explain the various theories propounded and an extensive bibliography is appended.

This abstract only deals with a small part of the original paper, which should be consulted by those interested in the subject.

Weiss (H. B.). **A Few Insects Injurious to Ornamental Plants.**—*New Jersey Dept. Agric., Bur. Statistics & Inspection, Trenton* Circ. 36, May 1921, 16 pp., 8 figs.

A brief account is here given of miscellaneous insects recently found in nurseries and greenhouses in New Jersey.

Chrysanthemum plants were considerably damaged by *Diarthronomyia hypogaea*, F. Loew (chrysanthemum midge), the life-history and control of which have already been noticed [*R.A.E.*, A, viii, 342, 364], and bay trees were attacked by *Trioza alacris*, Flor (bay flea-louse) [*R.A.E.*, A, viii, 43].

Geranium, cyclamen and snapdragon plants are often seriously damaged by *Tarsonemus pallidus*, Banks (pallid mite) [*R.A.E.*, A, v. 507, 576], but if the plants are well spaced the injury is less serious.

The larvae of *Euclea indetermina*, Bdv. (rose slug-caterpillar) often feed in nurseries on rose, apple, cherry, buttonball and other trees and plants. Eggs are deposited in July and hatch in nine days. The mature larvae are found on the lower sides of the leaves in September. Hibernation occurs in the pupal stage among loose leaves on the ground, and the adults emerge in July. Spraying with lead arsenate kills the larvae. Hand-picking is sufficient for slight infestations, but a glove should be worn, as the larvae have irritating spines.

Enlarged and swelling stems of *Rosa rugosa* indicate infestation by *Agrilus viridis*, L. (rose stem-girdler). Eggs are laid singly in the bark. The larvae enter the sap-wood, making spiral channels, over which the swelling appears. Pupation occurs above the swelling, causing shallow splittings of the bark. The adults emerge in June and July. This pest has been known to attack forest trees, the larval period extending over two years. The only known remedial measure is the cutting and burning of infested stems in the spring and autumn.

The life-history and control of *Neocerata* (*Dasyneura*) *rhodophaga*, Coq. (rose midge) have already been noticed [*R.A.E.*, A, vii, 211, 321].

Various species of poplar and willow are attacked by *Melalopha inclusa*, Hb. (poplar leaf-tier). There are two generations a year, adults emerging in May–July and August–October. The caterpillars feed in colonies, eventually eating all the leaves, except the terminal ones, which are pulled together as a shelter, in which the pupal stage is passed. All leafy nests should be cut and destroyed, failing which spraying with 3 lb. lead arsenate paste to 50 U.S. gals. water is recommended.

Phytomyza aquilegiae, Hardy (columbine leaf-miner) first appears in May. The female punctures and feeds on the leaf tissue, and then deposits eggs on the lower sides of the leaves. They hatch in a week, and the feeding larvae make mines in the leaves, and in two weeks pass to the pupal stage, which lasts another two weeks. There are several generations, the last pupae over-wintering in the ground.

Several parasites attack this pest, but are not sufficient to control the first brood. The ground about the plants should be cultivated after the last pupation, or in spring before the flies appear. All infested leaves should be removed and destroyed.

Gargara genistae, F. (caragana tree-hopper) has been introduced from Europe. It inhabits *Caragana arborescens*, but causes little damage in spite of its numbers. The over-wintering eggs hatch in June, and the nymphal stages occupy about a month. The larvae and adults are attended by ants, and being sluggish, are easily captured.

Dichomeris marginellus, F. (juniper webworm) after several years has reappeared in the north. The larvae are gregarious, and web up the foliage of junipers, where they pupate; they feed on the dead as well as the healthy foliage. The adults appear in June. An effective spray is 3 lb. lead arsenate paste, or 1½ lb. powder, to 50 U.S. gals. water.

LUGINBILL (P.). U.S. Bur Entom. **Injurious Insect Pests of Cereal and Forage Crops of South Carolina.**—*15th & 16th Ann. Repts., 1918 & 1919, S. Carolina Commiss. Agric. Comm. & Ind., Columbia,* 1919 and 1920, pp. 113–115 and 217–219. [Received 9th July 1921.]

These notes, given in both of the reports, refer to insect pests in South Carolina in 1918. *Blissus leucopterus,* Say (chinch bug) was very destructive to maize in the northern part of the State. *Laphygma frugiperda,* S. & A. (fall army-worm or southern army-worm) appeared in early July and damaged maize, lucerne and young sorghum. *Diabrotica duodecimpunctata,* Ol. (southern corn rootworm) was injurious to maize, but to a less extent than in the previous year. *Mayetiola destructor* (Hessian fly) has been reported, for the first time authentically, as damaging wheat in the northern parts of the State. Minor pests included *Chaetocnema* sp. (flea-beetles), *Prodenia ornithogalli,* Gn. (cotton cutworm) and others.

LUGINBILL (P.). **On the Biology of** *Aphis avenae,* **Fab., in the South-east, with Causes conducive to the Unusual Abundance of this Species as well as** *Toxoptera graminum,* **Rond., during certain Seasons.**—*16th Ann. Rept. 1919, S. Carolina Commiss. Agric. Comm. & Ind., Columbia,* 1920, pp. 219–229, 4 figs. [Received 9th July 1921.]

During the outbreak of *Toxoptera graminum,* Rond. (spring grain aphis) on oats in the south-eastern States in January–March 1913 [*R.A.E.*, A, vi, 468] *Aphis avenae* (oat aphis) was also present in considerable numbers, and a good deal of information was obtained regarding the latter species in the vicinity of Columbia, South Carolina. The variation in length of life of individuals during the year is shown in a graph; the average longevity of individuals produced during the summer months was about 22 days, increasing to 25 days for those born in autumn, and 75 days for those produced in winter. The number of young of the individuals constituting the generations are compared in a graph. The average number of young per individual during the summer months was about 33, and for the winter months 38. In the year in question there were found to be approximately 24 generations in the course of a year. No oviparous forms appeared in this series. It is quite probable, however, that had the species been kept in breeding condition, oviparous forms would have appeared later on, perhaps in the autumn of 1914.

It has long been recognised that certain meteorological conditions favour an unusual abundance of Aphids during certain seasons. It has been suggested that during cool, wet springs the parasites and other enemies of Aphids are held in check, while the Aphids continue to multiply and will then outnumber their enemies when the weather becomes warmer and all are active again. During such periods great damage to crops is often done by the Aphids. In the middle-western States the minimum temperature at which Aphids breed has been fixed at 40° F., while parasites require a temperature of at least 56° F. In the south-eastern States outbreaks come somewhat earlier. It is the author's opinion that heavy rains at frequent intervals, instead of being conducive, are a hindrance to an outbreak, as large numbers of the Aphids, especially young forms, are killed by direct action of the rain.

This paper, without the graphs, was printed in the 15th Annual Report for 1918.

The Boll Weevil.—*16th Ann. Rept. 1919, S. Carolina Commiss. Agric. Comm. & Ind., Columbia,* 1920, pp. 265–288. [Received 9th July 1921.]

The results of dusting as a remedy against the boll weevil [*Anthonomus grandis*] are briefly discussed; no definite recommendation in favour of this method is considered possible at present. It is pointed out that the general practices advocated against the pest are practically the same as those demanded in good farming. The acreage planted with peanuts in South Carolina is increasing, and it is thought that this crop might profitably be substituted for cotton in many districts.

Professor A. F. Conradi is of opinion that the boll weevil will in future be a permanent limiting factor in cotton production in the State. He considers that the poisoning method warrants a thorough investigation of its merits, and thinks that early failures were due to the crude state of the poisons and the apparatus for applying them. Mr. Swinton Whaley's advice, after the severe infestation of 1919, was to resort to diversified methods of farming, cultivating cotton only as a surplus crop; to use the intensive system and poison with calcium arsenate.

Boll Weevil.—*17th Ann. Rept. 1920, S. Carolina Commiss. Agric. Comm. & Ind., Columbia,* 1921, pp. 130–138. [Received 9th July 1921.]

The menace of infestation by the boll weevil [*Anthonomus grandis*] in South Carolina in 1920 was so clearly foreseen [see preceding paper], and farmers so far protected themselves by diversified agriculture, that the calamity was much less than had been anticipated; in fact, careful farmers in the boll weevil area were more prosperous than those in parts of the State remote from the infested areas, who gave their entire land to cotton-growing. The various agricultural practices adopted by the different counties of South Carolina in this respect are reviewed by various authors

Ruggles (A. G.). **Report of the State Entomologist for the Year ending 1st December 1920.**—*18th Rept. Minnesota State Ent., Agric. Expt. Sta., Univ. Farm, St. Paul,* 18th June 1921, pp. 3–12.

The inspection of nurseries was extended during the year under review to include a large number of orchards, particularly those of commercial size. During 1919 narcissus bulbs from Holland were found to be infested with *Merodon equestris*, F., among which larvae of *Eumerus strigatus*, Fall. (lunate onion fly) were also found.

The usual insect pests were more or less troublesome during the year. Those recorded for the first time from Minnesota as causing serious injury are *Rhagoletis pomonella*, Walsh, which occurred practically over the whole of the southern half of the State on the common varieties of apple, *Crataegus* and the wolfberry (*Symphiocarpus occidentalis*), and *Crioceris asparagi*, L. (asparagus beetle). During 1919 there was a serious outbreak of the army worm [*Cirphis unipuncta*], the principal damage being caused to oats; but flax, maize and wheat were also attacked. The onion maggot [*Hylemyia antiqua*] and the onion thrips [*Thrips tabaci*] were also in evidence.

Experiments with orchard spraying show that lead arsenate and calcium arsenate are equally effective against codling moth [*Cydia pomonella*] or leaf-eating insects.

Galls frequently found on the leaves of poplars are caused by the Aphids, *Pemphigus populicaulis*, Fitch, and *P. populitransversus*, Riley. Defoliation of these plants was complained of in several instances, and it is thought to be possibly due to squirrels (*Sciurus hudsonius*) feeding on the galls and their contents. Experiments with insects working in logs suggest the possibility of shading logs as a protection against their depredations.

Chapman (R. N.). **Observations on Mites infesting Flour and Mill Feed.**—*18th Rept. Minnesota State Ent., Agric. Expt. Sta., Univ. Farm, St. Paul,* 18th June 1921, pp. 20–25.

A brief summary is given of the general life-history and possible means of combating Tyroglyphids infesting flour and mill feeds [*R.A.E.*, A, vii, 91].

Graham (S. A.). **Factors influencing the Subcortical Temperatures of Logs.**—*18th Rept. Minnesota State Ent., Agric. Expt. Sta., Univ. Farm, St. Paul,* 18th June 1921, pp. 26–42, 5 plates.

In this paper, which is part of a more extensive work dealing with the oecology of wood-boring insects, the factors influencing the subcortical temperature of logs are considered. These include solar radiation, character of bark, air temperature and movement, evaporation from bark surfaces and proximity to other radiating or absorbing surfaces.

Observations indicate that the weekly turning of logs as recommended by Craighead [*R.A.E.*, A, viii, 365] may prove an effective means of destroying many wood-boring insects; but it cannot be applied in all cases, as some logs, particularly those with thick, light-coloured bark, will remain below the temperature fatal to insects even on very bright warm days. In using this method the position of the log with reference to the sun must be considered; those lying east and west will often reach a higher temperature in a small area than those lying north and south, but the latter will be heated over a much greater surface

Cook (W. C.). **Studies on the Flight of Nocturnal Lepidoptera.**—*18th Rept. Minnesota State Ent., Agric. Expt. Sta., Univ. Farm, St. Paul,* 18th June 1921, pp. 43–56, 2 plates.

The seasonal and meteorological relations of adult Noctuids belonging to the genera *Agrotis, Agroperina* (*Septis*), *Sidemia, Euxoa, Feltia, Cirphis, Polia,* etc. are discussed. As a result of observations made in 1920 it was found that temperature and humidity are more closely correlated to the numbers caught than pressure. Humidity is the most important factor studied. Any increase up to about 54 per cent. in the humidity at 7 p.m., which represents a higher degree during the night, tends to increase the catch, but beyond that value it is decreased in almost the same proportion. Although temperature has always a positive influence, it is larger below than above optimum humidity. The correlation coefficients, although not an accurate measure of relationship between factors, are at least a relative or qualitative measure.

The hot dry weather during July and August materially reduced the second brood of various species, especially *Cirphis unipuncta*. *Agrotis c-nigrum* and *A. ypsilon* are double-brooded in Minnesota. *Balsa malana* was unusually abundant; the larvae live on apple but are apparently of no economic importance. There is no record of the first brood of *Cydia* (*Carpocapsa*) *pomonella*.

Moore (W.). **The Principles of Film-forming Sprays.**—*18th Rept. Minnesota State Ent., Agric. Expt. Sta., Univ. Farm, St. Paul,* 18th June 1921, pp. 57–62.

The forces that cause the spray to collect into drops or spread into a thin film on the leaf surface are explained, and the method of making the more desirable film-forming sprays is discussed. No particular substance is definitely advocated as the cost and other factors must be further considered.

Oestlund (O. W.). **Contribution to the Knowledge of the Group Aphidina, Family Aphididae (Homoptera).**—*18th Rept. Minnesota State Ent., Agric. Expt. Sta., Univ. Farm, St. Paul,* 18th June 1921, pp. 63–75.

This paper supplements previous work [*R.A.E.*, A, vii, 326] and deals with the group Aphidina but without consideration of the genera and species. Keys to the subtribes of the Aphidini and and Macrosiphini are given.

Knight (H. H.). **Monograph of the North American Species of** *Deraeocoris* **(Heteroptera, Miridae).**—*18th Rept. Minnesota State Ent., Agric. Expt. Sta., Univ. Farm, St. Paul,* 18th June 1921, pp. 76–210, 1 plate, 44 figs.

The genus *Deraeocoris* now includes all the species that have been described under *Camptobrochis*. Of the 54 species dealt with in this paper 37 are new, and of the 22 varieties 20 are new. The general scarcity of these insects, compared with leaf-feeding species, is an indication of their predatory habits. Several species live on conifers, where they appear to be associated with Aphids and other soft-bodied insects. *D. pinicola*, sp. n., feeds on *Chermes pinicorticis*, Fitch (pine-bark Aphid), and *D. nubilus*, sp. n., probably has similar habits. *D. laricicola*, sp. n., apparently breeds only on larch (*Larix laricina*), and was found feeding on the sap of the plant. *D. aphidiphagus*, sp. n., feeds on *Eriosoma* (*Schizoneura*) *americanum*, Riley; *D. nitenatus*, n. n. (= *nitens*, Reut.) on *E.* (*S.*) *lanigerum*, Hausm., on elm; and *D. fasciolus*, sp. n., on *Aphis sorbi*, Kalt., on apple, *E.* (*S.*) *crataegi*, Oestlund, on *Crataegus*, and *Phyllaphis fagi*, L., on beech.

Agee (H. P.). **Director's Report.**—*Proc. 40th Ann. Meeting Hawaiian Sugar Planters' Assoc., Honolulu, November 29th and 30th 1920*; 1921, pp. 148–184.

The achievements of twenty-five years' work of the Station are briefly reviewed. The parasitic control of the leaf-hopper, the cane-borer and *Anomala* [*orientalis*], and the service rendered on manufacturing lines, are particularly mentioned.

During the past year serious infestations of the leaf-hopper [*Perkinsiella saccharicida*] have been scarce. The damage in Kallai and Oahu was hardly noticeable, except in the latter, where fields of one variety of young plant-cane were heavily infested in the spring, continuing into the summer. Where drought conditions prevailed this pest affected the growth of the cane. The severest injury always occurs in late-planted fields. It is difficult to estimate whether artificial or natural control measures are the more successful. The annual report of the Olaa Sugar Company states that seed traps and spraying with a dilute solution of nicotine sulphate are proving more valuable than parasitic control.

Spraying has little effect on the leaf-hopper parasite, *Paranagrus* [*R.A.E.*, A, viii, 430]. *Drypta australis* and *Cyrtorhinus mundulus*, introduced from Australia, have already been noticed [*R.A.E.*, A, viii, 525].

Antonina australis, a scale that feeds on nut grass, has also been introduced from Australia.

Anomala [*orientalis*] hardly exists now, owing to its parasite, *Scolia manilae*, many females of which have been distributed through the various colonies. This parasite is largely dependent on the larvae of the rose beetle, *Adoretus* [*sinicus*], and owing to the reduction in the numbers of this beetle, rose bushes can now be grown and vineyards are little damaged.

Experiments with poison and repellents against *Monocrepidius exul*, attacking seed cane [*R.A.E.*, A,, viii, 461] show little promise. Visits are being made to the Philippines and Australia in the hope of discovering a natural enemy of this wireworm.

Coccinella arcuata and *Micromus vinaceus* (lacewing fly), brought from Australia in 1919, have been bred out and distributed over the colonies to combat Aphids. The New Guinea Tachinid fly [*Ceromasia sphenophori*] still continues to hold in check the cane-borer [*Rhabdocnemis obscura*].

During the summer of 1920 *Tarsonemus bancrofti* (cane blister-mite) caused serious damage to cane sticks in one plantation. The mite operates under the green leaf bases, causing tiny blisters on the internodes.

KIEFFER (J. J.). **Un Platygastérine Parasite d'un Cynipide.**—*Broteria, Braga*, Sér. Zool., xix, no 2, 1st June 1921, pp. 68–69.

Up to the present no Platygasterine was known to parasitise another Hymenopteron. This paper describes *Fahringeria synergorum*, gen. et sp. n., several specimens of which were living in the galls of *Biorrhiza pallida*, Olivier, where they were endoparasites of the larvae of *Synergus gallae-pomiformis*, Boyer (*facialis*, Htg.), a commensal of the other Cynipid.

PASSALACQUA (V.). **Contro gli Afidi dei Pomidoro e delle Cucurbitacee** [Measures against Aphids infesting the Tomato and Cucurbitaceae.]—*Il Rinnovamento Econ.-Agrar., Trapani*, xv, no. 4, April 1921, pp. 58–59.

Against the black aphis, attacking tomatos, melons and pumpkins in the province of Trapani, Sicily, spraying with a 3 per cent. soap solution, or with one of lime-sulphur or phenicated tobacco extract, is the remedy advocated.

REINKING (O. A.). **Notes on Coccids and Aleyrodes on various Hosts in Indo-China and Siam.**—*Philippine Agriculturist, Los Baños,* ix, no. 6-7, January–February 1921, p. 185. [Received 11th July 1921.]

In a collection of Coccids and Aleurodids made in June and July 1920 the following were obtained in Indo-China :—*Coccus viridis,* Green, on coffee (*Coffea liberica*) ; *Chrysomphalus aurantii,* Mask., *Lepidosaphes beckii,* Newm., *Paralecanium expansum* var. *quadratum,* Green (?) and *Phenacaspis eugeniae,* Mask. (?) on black pepper (*Piper nigrum*) ; *Paralecanium expansum* var. *quadratum,* Green (?) on mango (*Mangifera indica*) ; and *Coccus* sp. on *Gardenia* sp.

In Siam, *Saissetia nigra,* Nietn., was found on *Hibiscus* sp., and a species of *Trialeurodes* on castor oil plant (*Ricinus communis*).

ZOTTA (G.). **Sur la Transmission expérimentale du** *Leptomonas pyrrhocoris,* **Z., chez des Insectes divers.**—*C. R. Soc. Biol., Paris,* lxxxv, no. 23, 25th June 1921, pp. 135–137.

This paper records the results of experiments in the direct inoculation of *Leptomonas pyrrhocoris* into the general cavity of *Galleria mellonella* (caterpillar), *Carausius morosus, Calliphora* sp., and *Tenebrio molitor* (larvae), which have no flagellosis of their own, and *Notonecta glauca* and *Naucoris cimicoïdes,* which have a special Leptomonad intestinal parasite.

L. pyrrhocoris, the normal parasite of *Pyrrhocoris apterus,* can be sucessfully inoculated into *N. glauca, N. cimicoïdes, G. mellonella* (caterpillar) and *Calliphora* sp. In these the flagellates find an excellent developmental medium and—especially in the larvae of *T. molitor* and *G. mellonella*—multiply greatly after 24–36 hours. After a few passages their virulence is so much increased that a small quantity of infected blood suffices to reproduce the infection. The larvae of *T. molitor,* and particularly those of *G. mellonella,* can resist the infection for a somewhat long period, and by regular passages it is possible to maintain the flagellates indefinitely in these insects. The caterpillar of *G. mellonella* is an excellent laboratory reservoir of the virus.

Infection was not achieved with the adult of *Hydrophilus piceus,* and a Phasmid, *Carausius morosus,* was also refractory, though the resistance of the latter does not seem to be absolute and may break down with a different technique.

In insects liable to infection there occurs an intensive phagocytosis, which is, however, unable to check the course of the infection. In *C. morosus,* in which the infection does not succeed with certainty, progressive degeneration of the flagellates free in the plasma points to a marked humoral reaction side by side with the intense phagocytosis.

The infection is usually fatal in the caterpillar of *G. mellonella,* and though pupation often occurs, the pupae die. In *T. molitor* the infection persists through all stages, and the imagines always harbour Leptomonads in their body fluid.

In order to speak of a true and definitive adaptation of *L. pyrrhocoris* to the insects mentioned above it is necessary to achieve an infection *per os* as well. A paper on this subject will be published later.

METALNIKOW (S.) & GASCHEN (H.). **Sur la Rapidité d'Immunisation chez la Chenille de** *Galleria*.—*C.R. Soc. Biol., Paris,* lxxxv, no. 24, 2nd July 1921, pp. 224–226.

Pursuing the investigation of the immunity of *Galleria mellonella* from various microbes, further experiments were made, such microbes as *Proteus, Bacillus coli* and the cholera vibrio, all of which are highly virulent to the caterpillar, being used as vaccines. Immunity was again easily obtained. It was also found that protection against fatal doses could be assured within three hours of the injection of the vaccine, and that weak doses of the latter acted more rapidly than strong ones. Furthermore, the caterpillars transmit their immunity to the resultant moths.

ZOTTA (G.). **Un** *Leptomonas* **du Type** *L. davidi,* **Laf., chez des Euphorbes de France.**—*C.R. Soc. Biol., Paris,* lxxxv, no. 24, 2nd July 1921, pp. 226–228.

A flagellate, held by the author to be *Leptomonas davidi,* Laf., was observed by him in *Euphorbia esula* var. *mosana* and *E. helioscopia* from Maine-et-Loire, this being the first record of Leptomonads in *Euphorbia* in France.

The various published papers on Leptomonad infection in *Euphorbia* are mentioned with references.

BALL (E. D.). **The smallest known Leaf Hopper.**—*Proc. Biol. Soc. Washington, D.C.,* xxxiv, no. 2, 31st March 1921, pp. 23–24.

Empoasca minuenda, sp. n., is described from Florida as attacking avocado. *E. minuenda* var. *moznettei,* n., and *E. minuenda* var. *clavigerana,* n., were found with the above.

McATEE (W. L.). **Membracidae of the Vicinity of Washington, D.C.**—*Proc. Biol. Soc. Washington, D.C.,* xxxiv, no. 25, 30th June 1921, pp. 123–134.

In this list of tree-hoppers collected in the District of Columbia, 46 species are recorded. Keys are given to the subfamilies, tribes, genera and species.

VAN DER MERWE (C. P.). **A Note on** *Dasychira extorta* **and its Lepidopterous Parasite.**—*S. African Jl. Sci., Johannesburg,* xvii, no. 2, April 1921, pp. 192–193.

In Durban, the larvae of *Dasychira extorta* feed on the foliage of *Ficus natalensis* at night, returning in the day to resting places on the tree-trunks, marked by cast skins and cocoons of Hymenopterous parasites. The pupal stage varies from 14 to 23 days, the moths emerging mostly in March, though early ones appear in December. In 1919 these caterpillars were found on the trees in May, in June crawling away in search of suitable places to spin their cocoons.

Small Lepidopterous larvae can be seen clinging to most of the caterpillars, as many as six having been found on one caterpillar. When the latter's cocoon is complete, the parasite may be found either on the caterpillar or between the cocoon layers. The parasites can penetrate the inner cocoon, but often die without causing injury,

or are killed by an oily liquid, which the host exudes after a week. From 2½ months to more than 5 months after the spinning of the cocoon the larvae attack the host, but it is not known what stimulates their feeding, which occurs either before or after the caterpillar's pupation. It is possible that the parasites are repelled by the oily excretion of the caterpillar, and only attack when this oil is insufficient or has become dissipated.

Some larvae mature early, finding one caterpillar enough, while others seek fresh cocoons, devouring any smaller individuals of their own species. The larval stage of the parasite varies from 6 to 12 months, and the pupal stage from 18 to 30 days.

The parasite has been determined as an apparently undescribed species, belonging to the PHYCITINAE.

SKAIFE (S. H.). **A Tachinid Parasite of the Honey Bee.**—*S. African Jl. Sci., Johannesburg,* xvii, no. 2, April 1921, pp. 196–200, 6 figs.

The work of previous authors on *Rondaniooestrus apivorus,* Vill., the Tachinid parasite of the honey bee, is briefly reviewed and the author gives his own observations, made at Cedara, on the life-history of this fly.

There are two generations a year. The eggs are hatched in the body of the female. The larvae are deposited on the adult worker bees returning to the hives, and possibly on drones, and feed on the abdominal tissues of the host. After three months, the bee dies and the larva pupates in the ground or beneath refuse, the pupal stage occupying seven to eight weeks in the summer and eight to ten in winter. The adults haunt the hives from December to February and May to July.

This pest is not a serious one, as many of the bees are old and worn out when attacked and their loss is negligible, while the younger bees work just as well till they die.

The remedial measures recommended are the killing of all flies round the hives, and the destruction of the puparia, which can be trapped by leaving boards on the ground.

GUNN (D.). **The False Codling-Moth** (*Argyroploce leucotreta,* **Meyr.**).—*Union S. African Dept. Agric., Pretoria,* Sci. Bull. 21, 1921, 28 pp., 3 figs, 1 plate, 15 tables.

In different provinces of the Union, in Rhodesia, and British East Africa, *Argyroploce leucotreta* Meyr. (false codling-moth) attacks many cultivated and wild fruits, but is mainly a pest in orange orchards. It closely resembles the true codling-moth [*Cydia pomonella*], except that it does not attack apples, pears and quinces.

Besides the food-plants already noticed [*R. A. E.,* A, iv, 278] it attacks walnuts, olives, persimmons, acorns [*R. A. E.* A, ii, 654] and the following native fruit trees: *Ximenia caffra, Chrysophyllum magalis-montanum, Royena pallens, Vanguirea infausta, Sclerocarya caffra, Podocarpus falcata, Combretum zeyheri, C. apiculatum,* and *Schotia speciosa.* Of these the first two are the most important. Lemons and limes are immune from attack.

The injury caused by this pest is similar to that of the true codling-moth, except that infested fruits, especially oranges, drop more prematurely or become mouldy. It is estimated that from 10 to 50 per cent. damage is caused annually.

On oranges, eggs are deposited separately, mostly on the rind, sometimes on leaves and twigs, and the average number is eight. The larvae spin threads over the rind, burrowing into it ultimately, and when mature they emerge and make a cocoon on the ground, or occasionally in sacks or boxes. The moths fly at night; experimentally they lived 3–5 days in dry conditions and 8–18 days when moisture was supplied.

There is no hibernation. In September–February the egg period ranged from 9 to 12 days, and in June–August, from 11 to 14 days. In the hot season the pupal stage lasted 30 days, and from August–February, 27–61 days, while in the cold season (May–July) it lasted 38–65 days.

Notes are given on the life-history of this pest in food-plants other than oranges.

It appears that moisture has considerable effect in controlling this insect, and where heavy rainfall was recorded, the infestation was only slight. Chalcid parasites are found in the eggs of this pest on oranges and guavas. They are not numerous until January and February, only parasitising the eggs of the second generation, and cannot be relied on for control.

Spraying with 1½ lb. lead arsenate powder to 50 gals. water to destroy the caterpillars before they burrowed into the rind gave good results. The first application should be made before the 15th January, the second three weeks later, and the third in the last week of February. A fourth spray in the middle of March is recommended if the orchard is near places where native food-plants are growing. Citrus fruits marketed from July–October should not be sprayed in these months, but if they are retained for later marketing, they can be twice sprayed, in the middle of September and October.

Moths emerging from guava trees grown near citrus orchards deposit eggs on ripening citrus fruits. If the latter are kept on the trees till late in the year, the moths emerge early in December, therefore infested trees should be sprayed before the middle of the month.

Lamp traps for moths and the banding of trees are of no avail.

Alternative food-plants should be destroyed and all fallen fruit should be collected and, if infested, buried deeply. Where possible, heavy irrigation of orchards annually in July and August, if there have been no winter rains, kills the larvae and pupae. Otherwise thorough cultivation, particularly underneath the trees, in these months is recommended.

Thompson (W. R.), U.S. Bur. Ent., & Thompson (M. C.). **Studies of** *Zenillia roseanae,* **B. & B., a Parasite of the European Corn Borer** (*Pyrausta nubilalis,* **Hb.**).—*Proc. Ent. Soc. Washington, D.C.*, xxiii, no. 6, June 1921, pp. 127–139, 3 plates.

A description is given of various stages of the Tachinid, *Zenillia roseanae,* B. & B., a parasite of *Pyrausta nubilalis,* Hb. (European corn borer) in southern France and the Mediterranean region, and the methods necessary in rearing and colonisation are discussed. The species was originally described under the genus *Myxexorista,* and as the original description was rather brief a more detailed one is given. Oviposition of *Z. roseanae* has not been observed, but probably the larvae are deposited directly on the caterpillars of *P. nubilalis* while the latter are feeding on the exterior of the plant or moving from place to place. Parasitic larvae of the autumn generation remain in the adipose tissue of the host during the winter, which they pass in the

second larval stage; after the second ecdysis they begin to devour indiscriminately all of the internal organs of the host caterpillar, leaving little but the skin. The larvae pupate in the gallery of the host, beside the empty skin of the caterpillar from which they have emerged. Apparently, they emerge from the hibernating caterpillars about a month before the latter begin to pupate, but the duration of the pupal and preoviposition periods of the parasite are so much longer than in the case of the host, that the adult females of the parasite are not ready to oviposit until the young caterpillars of *P. nubilalis* are present on the maize. The first puparium found under outdoor conditions in 1920 was taken on 24th March, on a maize stalk. *Z. roseanae,* like *P. nubilalis,* has two generations a year in south-western France.

Z. roseanae has also been recorded as a parasite of the grape pest, *Phalonia* (*Conchylis*) *roseana,* Hw., but the authors have not had the opportunity to confirm this. A Chalcid parasite has on one occasion been found in a puparium of *Z. roseanae.* The importance of the latter as an enemy of *P. nubilalis* is not yet determined, but its introduction into the United States would seem to be a comparatively easy matter in view of its biology.

FLUKE (C. L.), Junr. **Poison the Grasshoppers.**—*Univ. Wisconsin, Coll. Agric., Madison,* Extens. Circ. 135, May 1921, 4 pp.

A large percentage of such crops as hay, oats, rye, peas, and wheat, is destroyed each year in Wisconsin by grasshoppers. The poison bait that has proved most satisfactory in that State is 25 lb. bran (or half bran and half sawdust), with 1 lb. white arsenic or Paris green, 1 lb. salt, and 12 teaspoonfuls of banana oil (or 6 whole oranges ground up) in 10 quarts of water. This amount is sufficient for five acres and the cost should not be more than 50 cents per acre. Only infested land requires treatment, and one application should be sufficient if all farmers apply the bait at the same time, after all the eggs have hatched. As a rule, however, it is best to continue applying the bait until all the grasshoppers have disappeared.

FAES (H.). **Les Traitements contre le Ver de la Vigne en 1920** (*Cochylis*).—*Progrès. Agric. & Vitic., Montpellier,* lxxvi, no. 28, 10th July 1921, pp. 38–42.

This paper on measures against *Clysia ambiguella* has already been noticed from another source [*R. A. E.*, A, ix, 399].

BLANCHARD (E.). **Contre la Pieride du Chou.**—*La Vie Agric. & Rur., Paris,* xix, no. 28, 9th July 1921, pp. 26–27, 2 figs.

Measures against the cabbage butterfly [*Pieris brassicae*] include collection of the eggs and caterpillars, dusting with quicklime, singeing by means of straw torches, and spraying with a petroleum emulsion, lysol, etc. A decoction of broom [*Genista*] is said to act as both an insecticide and a repellent. It is said that branches of broom planted between the cabbages will protect the latter against infestation. Another method that has proved effective consists in planting rows of hemp and Jerusalem artichokes among the cabbages; these plants being of greater height compel the butterflies to fly higher and oviposition on the cabbages is avoided. The most serious natural enemy of the pest is the larval parasite, *Apanteles* (*Microgaster*) *glomeratus,* which oviposits in the caterpillars. The artificial breeding of this Hymenopteron may prove useful.

Gossard (H. A.) & Parks (T. H.). **Hessian Fly Prevention.**—*Mthly. Bull. Ohio Agric. Expt. Sta., Wooster,* vi, no. 5–6, May–June 1921, pp. 67–76, 3 tables.

The information contained in this paper has already been noticed [*R. A.E.*, A, ix, 245].

Judd (C. S.). **Introducing Fig Wasps.**—*Hawaiian Forester & Agriculturist, Honolulu,* xviii, no. 4, April 1921, pp. 76–79.

The Board of Agriculture and Forestry passed a resolution in September 1920 that the introduction of fig wasps be allowed for the fertilisation of the " seed of certain species of *Ficus,*" these trees being suitable for purposes of reforestation.

The author asked the Board to limit the introduction of these wasps to those which only fertilise the following species :—*Ficus benjamina* (Benjamin fig), *F. elastica* (Indian caoutchouc), *F. macrophylla* (Moreton Bay fig), *F. religiosa* (peepul tree), and *F. retusa* (Chinese banyan). Also that the Entomologist should be instructed to study the habits of these wasps before sending material to Hawaiian territory.

The Board accordingly passed a motion confirming these recommendations in March 1921.

Morstatt (H.). **Bibliographie der Pflanzenschutzliteratur. Das Jahr 1920.** [A Bibliography of the Plant Protection Literature in 1920.]—*Biol. Reichsanst. Land- u. Forstwirtschaft, Berlin,* 1921, 71 pp.

In 1913 the bibliographical series " Hollrungs Jahresberichten über das Gebiet der Pflanzenkrankheiten " stopped publication. This issue is intended as a continuation, and the present part covers 1920. The intervening years 1914–19 will be dealt with in a part to be published in the coming autumn

da Matta (A.). **Os Insectos damninhos. X. Uma Lepidobroca da Bananeira,** *Castnia licus,* **Fab.** [Injurious Insects. X. A Caterpillar Pest of the Banana, *C. licus.*]—*Chacaras e Quintaes, S. Paulo,* xxiii, no. 2, 15th February 1921, pp. 101–102, 1 fig. [Received 15th July 1921.]

For more than two years bananas, *Musa sapientium* and *M. paradisiaca,* cultivated in Manaos have been severely attacked by the caterpillars of *Castnia licus.* The capture of the moths by means of nets is advised.

du Buysson (H.). *Phora fasciata,* **Fall. (Dipt.) parasité par** *Homalotylus eitelweinii,* **Ratzb. (Hym.)**—*Miscellanea Ent., Uzès,* xxv, no. 9, May–June 1921, pp. 66–67.

Phora fasciata, Fall., a parasite of *Coccinella septempunctata,* L., is hyperparasitised by the Chalcid, *Homalotylus eitelweinii,* Ratzb.

Andrews (F. A.). **Insect Pests of Tea in North-east India during the Season 1920.**—*Qtrly. Jl. Scient. Dept. Ind. Tea Assoc., Calcutta,* 1921, pt. 1, pp. 1–8.

During 1920 mosquito blight [*Helopeltis*] was more serious than in the previous year, the variation being undoubtedly due to rainfall,

thus indicating the necessity for careful attention to drainage. Although Aphids appeared in the usual numbers they did comparatively very little damage, probably owing to the condition of the bushes. Other pests recorded are: *Serica assamensis*, Brenske, occurring in April; a Liparid, probably *Leucoma submarginata*, found in February; *Brachytrypes achatinus*, Stoll, causing serious damage to green manures—this cricket was most abundant in March and disappeared by July; *Diapromorpha melanopus*, Lac. (orange beetle), adults of which appear in March to April and July to August; *Helopeltis theivora*, Waterh.; *Toxoptera coffeae*, Nietn. (*Ceylonia theaecola*, Buckt.) (tea aphis), against which phenyle solution was successfully used; *Andraca bipunctata*, Wlk. (bunch caterpillar), which occurred in large numbers in May and June; *Zeuzera coffeae*, Nietn. (red borer); *Arbela* spp.; *Belippa* spp.; *Homona menciana*, Wlk. (tea tortrix); *Biston suppressaria*, Gn.; *Clania* spp.; *Psyche assamica*, Watt (conical Psychid); termites, occurring in May and August—forking round the bushes appears to check this pest; *Tetranychus bioculatus*, W.-M.; *Eriophyes* (*Phytoptus*) *theae*, Watt; and a stalk-killing mite, against which lime-sulphur solution was used with success.

Zur Arsenfrage im Weinbau. [On the Arsenic Question in Viticulture.]—*Luxemburger Weinztg., Grevenmacher,* ix, no. 12, 11th June 1921, pp. 132–133.

At a recent meeting of viticulturists in Germany the question of arsenical poisoning as the result of the use of sprays against vine moths was discussed. It appears that the difference in the arsenic content of treated and untreated vines is so slight that there can be no question of its detrimental effect. Vines treated only with nicotine showed the same arsenic content as those sprayed with arsenicals.

PETHYBRIDGE (G. H.), LAFFERTY (H. A.) & RHYNEHART (F. G.). **Investigations on Flax Diseases.**—*Jl. Dept. Agric. & Tech. Instr. Ireland, Dublin,* xxi, no. 2, 1921, pp. 167–187, 13 figs.

This report gives the result of investigations of flax diseases and pests during 1920 in Ireland.

Lea oats are attacked by the larvae of the cranefly (*Tipula* sp.), and if flax is planted after this crop it also is attacked by this pest. Owing to varying opinions, experiments were carried out to discover if the damage was caused by cranefly or wireworms (*Agriotes* sp.). Flax was sown in two plots of soil sterilised by heat. When the shoots appeared some "leather jacket" larvae were put into one plot only. The larvae were only active during the night, when they came to the surface and bit through the young flax stems, dragging them down with them below ground. The majority of the plants were destroyed, while the other plot showed healthy plants. The same results were obtained under field conditions. The same experiment was made with wireworms, but no difference was noticed in the plants of either plot, and the roots had not been damaged. Further experiments will be continued, but it does not appear that wireworms are a serious pest of flax.

Flax is also attacked by *Longitarsus parvulus*, Payk. (flax flea-beetle). Mature larvae were found in 1919 from the end of July to the middle of August. They live in the soil, and pupate there. The first adults emerged late in August, the maximum being reached early in September.

They were found in large numbers on flax stalks left behind in pulled fields. They were also seen on grasses, clover and weeds, but it is not known whether they feed on them. They become less active early in October, and seek places for hibernation. The hibernating beetles were found in sheltered places near flax fields of the previous season, below the grass growing on an unploughed flax field, and also in a field sown with grass after flax. It is evident that the beetles which emerge in August and September after the winter resting period cause the most damage. It is not yet known if there is more than one generation a year.

The remedial measures recommended are the application of ½ cwt. nitrate of soda per acre for young plants. The sowing time and preparation of the seed-bed need careful consideration. Fields should be thoroughly cultivated and rolled after the flax has been pulled, to destroy the larvae and pupae. In the case of fields laid down to grass, soil insecticides may be effective, and experiments are being started on these lines.

Calocoris bipunctatus, F. (Capsid plant bug) sucks the juice of flax, and also damages potatoes, beans and peas. When the growing point is attacked the plant becomes branched. Large swellings occur where the epidermis is punctured, and render the plants liable to attack by a fungus (*Botrytis*). The female lays eggs in the stems and leaves of the plants. and the larvae feed throughout the summer, the winged adults appearing towards the end of July.

The remedial measure recommended is the ploughing of fields not sown to grass immediately after pulling. These bugs have been controlled on fruit trees by spraying with a wash containing nicotine and soap. Experiments of this nature will be carried out on flax.

PAGLIANO (T.). **Il Pidocchio nero degli Agrumi in Tunisia.** [The Black Scale of *Citrus* in Tunisia.]—*Bull. Soc. d' Hortic. Tunisie, Tunis,* xix, 1921, pp. 55–59. (Abstract in *L' Agric. Colon., Florence,* xv, no. 7, July 1921, pp. 386–387.)

The black scale of *Citrus, Parlatoria zizyphi,* is a well-known pest in Tunisia, where several generations occur in a year. Remedial measures may be applied from April to November, and include the following effective sprays : Black soap 5 lb., petroleum 2 gals., copper sulphate 5 lb., water 50 gals. ; and titrated nicotine extract 1 gal., sodium carbonate 2 lb., black soap 10 lb., methylated spirit 1 gal., water 100 gals.

VATTIER (J.). **La Séricicülture et la Culture du Mûrier à Fez.**—*Rev. Agric. Afr. Nord, Algiers,* xix, no. 102, 15th July 1921, pp. 546–553, 4 figs.

This article deals with silkworm breeding and mulberry cultivation in Morocco, especially around Fez.

JABLONOWSKI (J.). **Lucernalevéltedü özöne s a borso veszedelme.** [An Aphid infesting Lucerne and liable to attack Peas.]—*Köztelek. Budapest,* xxxi, no. 20, 14th May 1921, pp. 441–442.

In April and May, *Macrosiphum pisi*, Kalt. (common pea aphis), caused considerable damage to lucerne crops in Hungary. During these months the weather was very hot and dry, but very cold at night, the thermometer dropping 8–9° C. below zero [19–17° F.], and so the

crops were poorly developed. The pest was heavily attacked by *Coccinella septempunctata* (seven-spotted ladybird), and Syrphid larvae, by *Aphidius* and other parasites, and by a fungus, *Empusa fresenii*. It appears that this pest is a new one in Hungary.

It is possible that *M. pisi* will also attack peas, to which it causes very severe damage in some years. In the third year of the war it destroyed the equivalent of 984 tons of dried peas.

The remedial measures recommended are the destruction of the over-wintering eggs on the lucerne at the beginning or end of the winter. The stubble should be harrowed and cleaned. The fields should be well manured every year, as in Hungary lucerne is planted three or four years running in the same field. All parasites and enemies should be protected. Spraying is of little value.

The following Coleoptera may also prove dangerous to lucerne:—*Gonioctena sexpunctata*, Panz., *Phytodecta fornicata*, Brügg., *Subcoccinella vigintiquatuorpunctata*, L., and *Epilachna globosa*, Schneid. The crop is usually attacked by the larvae of these pests after the first mowing, and is occasionally entirely destroyed.

JABLONOWSKI (J.). **A réti gyapjas pille kártékonysága.** [The Damage caused to Agriculture by the Woolly Meadow-moth.]—*Kisérletügyi Közlemények, Budapest,* xxiv, no. 1, 15th May 1921, pp. 78-95, 1 fig, 2 graphs.

Hypogymna morio, L. (woolly meadow moth) has been a pest in Hungary since 1902. The eggs are laid at the base of different plants, the larvae appear in June, and remain hidden throughout the winter in the earth or under dead leaves. In April and May they cause the most damage, eating the young shoots of the meadow grasses, so that there is sometimes no pasture for grazing cattle. They pupate in May, and the adults emerge from the middle of May to the beginning of June. There is only one generation a year. In severe outbreaks this pest has been known to attack grain crops such as wheat and rye.

Bush harrowing is recommended when the caterpillars are abundant. Spraying has no effect.

JABLONOWSKI (J.). **Ismét a muszhahernyó.** [The Larvae of the Russian Moth, *Loxostege sticticalis*, L.]—*Köztelek, Budapest,* xxxi, no. 29, 16th July 1921, pp. 649–650.

An outbreak, over the greater part of Hungary, of *Loxostege sticticalis* caused considerable damage in June and July to all kinds of vegetable crops, sugar-beet, maize and lucerne. The larvae of the second generation were about to pupate in the middle of July, while some appeared to be dying of an infectious disease.

Eggs are deposited on weeds growing between the cultivated plants. The larvae feed on these weeds, then crawl to the plants or crops.

Some farmers attempted to control this pest by means of burning, digging, and spraying with Paris green, and barium chloride, but during these measures the larvae rapidly pupated, so it is difficult to judge the results.

All weeds, particularly *Chenopodium*, *Convolvulus* and *Cirsium*, on which this pest feeds before and during cultivation, should be removed after larvae on them have been destroyed. Spraying with Paris green or barium chloride is recommended.

SCHLUMBERGER (—). **Der Deutsche Pflanzenschutzdienst auf den 28. Wanderaustellung der D. L. G. in Leipzig vom 16. bis 21. Juni 1921.** [The German Plant Protection Service at the 28th Travelling Exhibition of the German Agricultural Society at Leipsic from the 16th to the 21st June 1921.]—*Nachrichtenbl. deutsch. Pflanzenschutzdienst, Berlin,* i, no. 1, 1st July 1921, pp. 2–3.

In order to promote co-operation in work against vegetable and animal enemies of plants, the Plant Protection Service developed in 1921 on a fairly large scale its previously rather restricted participation in the travelling exhibition. Attention was chiefly given to pests occurring in Saxony. Information on the work of the Imperial Biological Institute was provided.

ZACHER (F.). **Ameisen als Wohnungsplage.** [Ants as House Pests.]—*Nachrichtenbl. deutsch. Pflanzenschutzdienst, Berlin,* i. no. 1, 1st July 1921, pp. 7–8.

The number of complaints of ants as indoor pests, especially in store rooms, has increased in Germany. The predominant native species are *Lasius niger,* L., and *Tetramorium caespitum,* L., but the opinion has been expressed that they are not responsible for the trouble, and that the ants concerned have been imported with foodstuffs from abroad. Marlatt has shown that nearly all the house-infesting ants in North America have been introduced from the tropics. One of these, *Monomorium pharaonis,* L., is an annoying pest in many localities in Germany.

The complete destruction of a nest and its inhabitants is the best remedial measure. If the former is located out of doors, carbon bisulphide or carbon tetrachloride may be poured into the entrance holes, which must then be sealed. The ants themselves may be combated indoors by pyrethrum powder. Napthaline or camphor have only a slight repellent effect. A weak solution of arsenic, such as a syrup containing $\frac{1}{4}$–$\frac{1}{8}$ per cent., is very effective, more so than a stronger poison, as the ants live long enough to carry the material to their larvae. A sponge soaked in the liquid may be placed in a container, the lid of which is perforated so as to allow the ants to enter. Food attractive to them must not be left exposed.

VAN EECKE (R.). **Kasbewonende Thysanoptera uit Nederland.** [Greenhouse Thysanoptera from Holland.]—*Ent. Ber. Ned. Ent. Vereen., The Hague,* v, no. 118, 1st March 1921, pp. 313–314.

The best known Thysanoptera found in greenhouses are *Heliothrips haemorrhoidalis,* Bch., and *Parthenothrips dracaenae,* Helger. These occur in Holland, as do *Heliothrips femoralis,* Reuter, *Euthrips orchidii,* Moulton, and *E. longipennis,* Bagn.

Bagnall's list of the Thysanoptera from the Botanical Gardens in Brussels (*Annales Soc. Ent. Belgique,* liii, 1909, pp. 171–176) is given.

OUDEMANS (J. T.). **Bijdrage tot de Kennis der Parasieten en Hyperparasieten van de Gestreepte Dennenrups** (*Panolis griseovariegata,* **Göze**). [A Contribution to the Knowledge of the Parasites and Hyperparasites of the Pine Moth, *P. flammea.*]—*Ent. Ber. Ned. Ent. Vereen., The Hague,* v, no. 119, 1st May 1921, pp. 330–338.

Pines in Holland were severely infested in 1918 and 1919 by the pine moth, *Panolis flammea,* Schiff. (*griseovariegata,* Göze) [*R. A. E.,*

A, viii, 225], and also suffered from other enemies, including a sawfly, *Acantholyda erythrocephala*, L., and the nun moth, *Liparis* (*Lymantria*) *monacha*. The resultant weakening of the trees also favoured beetle infestation.

The investigations here described took place on the author's own property near Putten, where many species of *Pinus*, *Picea* and *Abies*, and *Pseudotsuga douglasi* occurred, though as *Pinus sylvestris* formed 99 per cent. of thestands there was no mixed forest in the ordinary sense.

Examination of the material beneath the moss cover showed that the normal fauna feeding on green pine needles had been displaced by *P. flammea* and *A. erythrocephala*. A second striking fact was that the total number of pupae of *Panolis* and their parasites was greater after an infestation of one year than after one of two years, possibly owing to the decrease of suitable food. The moths also appear to prefer unattacked trees for oviposition.

The material found in February and March 1919 included the following: living and dead pupae of *Panolis* and cocoons emptied or abandoned by parasites; full and empty cocoons of a Braconid, *Meteorus albiditarsus*, Curt., and of an Ichneumon, *Banchus femoralis*, Thoms., and cocoons of *Panzeria rudis*, Fall. All the above parasites are connected with *Panolis*. Furthermore, there were pupae and numerous larvae of *Acantholyda erythrocephala*, showing that the pupal period of this sawfly was about to begin; some of the larvae were at some depth in the ground, and they seem to hibernate twice (and perhaps three times) before pupating. The cocoons of an Ichneumon parasite of *A. erythrocephala*, *Xenoschesis fulvipes*, Grav., were seen. There were a few larvae and pupae of *A. pinivora*, Ensl., but they did no injury in the present case. This species hibernates two or three times before pupating. A few cocoons of another genus of sawfly, *Lophyrus*, including two of *Lophyrus nemorum*, L., were also noticed, and some hibernating queens of *Vespa rufa*, L., were occasionally found.

In the spring of 1920 special attention was paid to *Panolis* and its parasites mentioned above, it being also observed that the other insects were exceedingly few. On an area of roughly 100–200 square yards 627 pupae of *P. flammea*, 817 cocoons of *M. albiditarsus*, 168 cocoons of *B. femoralis*, and 1,745 pupae of *Panzeria rudis* were collected.

The cocoons of *P. flammea* yielded 240 living moths, 212 moths shrivelled and dead, and 32 dead pupae. The following Ichneumonid parasites were also obtained: 134 *Ichneumon pachymerus*, Ratz., four *Exochilum circumflexum*, L., one undetermined specimen (section OPHIONINAE), and one *Microcryptus arrogans*, Grav.

The cocoons of *M. albiditarsus* yielded more than half their number of the Braconid itself and the following Ichneumonid hyperparasites: numerous specimens of *Microcryptus arrogans*, Grav., one each of *M. perspicillator*, Grav., *Hemiteles* sp., *H. castaneus*, Tasch., *Angitia tenuipes*, Thoms., and *Astiphromma strenuum*, Holmgr., and two of *Hemiteles pedestris*, F.

The cocoons of *Banchus femoralis* yielded the following Ichneumonid hyperparasites: nine *Microcryptus arrogans*, one *Hemiteles castaneus* and one of an undetermined species.

The pupae of *Panzeria rudis* yielded adults in over 90 per cent. of the cases. From thirty to forty of them an Ichneumonid was obtained that Smits van Burgst determined as a new species of *Phygadeuon*; this may be a parasite special to *P. rudis*. Other hyperparasites included two specimens of *H. castaneus*, and numerous minute Chalcids.

SALTET (R. H.). and LUBSEN (C. H.). **Over den Invloed van Blauwzuur op de Eieren van** *Malacosoma neustria*, **L.** [The Effect of Hydrocyanic Acid Gas on the Eggs of *M. neustria.*]—*Ent. Ber. Ned. Ent. Vereen., The Hague,* v, no. 120, 1st July 1921, pp. 345–348.

Experiments made in 1919, 1920 and 1921 show that even so high a strength as 2½ volumes of hydrocyanic acid gas per cent. (which is probably the highest possible for practical use) has little or no effect on the eggs of *Malacosoma neustria*, L., which thus differ from those of many other insects.

RÜSCHKAMP (P. F.). **Zur Biologie der Dermestidae (Col.).** [On the Biology of Dermestids.]—*Ent. Ber. Ned. Ent. Vereen., The Hague,* v, no. 120, 1st July 1921, pp. 348–351.

The statement that *Megatoma undata*, L., develops in old wood may lead to the assumption that its larva feeds on such material, but this does not agree with the habits of closely allied species, such as *Anthrenus museorum*, L., which are known to feed on animal débris. The larva of *M. undata* does not seem to be an exception. Lentz thought that it fed on sawfly larvae and Calwer-Schaufuss stated that it occurs in elms infested with *Cossus* and in the mines of the wood wasp, *Xylocopa*. The author has observed it together with *Xestobium rufovillosum*, Gylh., and with bees. All these facts point to it being carnivorous. Like the larva of *A. museorum* it appears to have a wide range in food. It is of interest to ascertain whether it preys on living larvae or on the dead bodies, for in the former case *M. undata* may be grouped with the Clerids among the most useful economic species.

In June and July the author observed *M. undata*, *Anthrenus fuscus*, Oliv., and *A. museorum*. About this time they occurred on various flowers, where they probably are harmless pollen-feeders and where mating takes place. Up to the flight period the adults seem to feed on fresh and old pollen in the nests of Hymenoptera.

Another Dermestid, *Trinodus hirtus*, F., has habits similar to those of *M. undata* and *A. museorum*. *A. scrophulariae* was again observed as a pest of museum collections. *A. verbasci* and *A. fuscus* were obtained from garden wood. The former species seems to develop more usually in the open than indoors, while the contrary is the case with the latter.

Orphilus glabratus, F. (*niger*, Rossi) appears to be confined to southern and eastern Germany.

SCHOEVERS (T. A. C.). **Een voor Cattleya's schadelijk Kevertje.** [A Beetle injurious to *Cattleya*.]—*Verslag & Meded. Phytopath. Dienst, Wageningen,* no. 18, February 1921, pp. 11–17, 3 figs.; also *Tijdschr. Plantenziekten, Wageningen,* xxvii, no. 6, June 1921, pp. 65–71, 1 fig.

Severe leaf injury noticed in a collection of *Cattleya* has been found to be due to a beetle which Dr. Ed. Everts considers to be *Mordellistena cattleyana*, described by G. C. Champion in 1913 from plants apparently brought from Venezuela.

The same pest has been reported from Berlin by v. Lengerken, who names it *M. beyrodti* [*R.A.E.*, A, ix, 67], being apparently unaware of Champion's paper.

In the present case the infestation was completely checked by picking most of the infested leaves and by enclosing the rest in waxed paper. By this means the adults were secured on emergence.

Iepenspintkevers. [Elm Sap-wood Beetles.] — *Phytopath. Dienst, Wageningen*, Vlugschr. 35, March 1921, 3 pp., 2 figs. ; also *Tijdschr. Plantenziekten, Wageningen*, xxvii, no. 6, June 1921, pp. 72–74, 2 figs.

There are two species of these beetles infesting elms, *Scolytus* (*Eccoptogaster*) *scolytus* and the smaller *S.* (*E.*) *multistriatus*.

The adults are on the wing in May and June. The female bores into the bark and mating occurs in the hole. The female then makes a vertical mine, on the sides of which the eggs are laid ; the larval galleries run horizontally from the parent mine. *S. multistriatus* makes a longer parent mine than the larger species. Although older and sickly trees are usually infested, young and vigorous trees may be attacked.

One remedy consists in removing the bark in winter and burning it. Slight infestation may be checked by painting with carbolineum about the middle of May ; for this purpose a 20 per cent. solution of soluble carbolineum is convenient. This coating appears to prevent the beetles from boring into the trunks, and it has even been said that contact with a treated surface kills them, but this requires confirmation.

Rostrup (S.). **Gulerods-Krusesyge, foraarsaget af Gulerods-Bladloppen** (*Trioza viridula*). [Carrot Leaf Curl, caused by *T. viridula*.]—*143. Beretning fra Statens Forsøgsvirksomhed i Plantekultur* ; also *Tidsskr. Planteavl, Copenhagen*, xxvii, 1921, pp. 617–630, 4 figs. (With an English Summary).

For many years carrot leaf curl has caused great damage in Denmark. Since the first ten years of this century, when it was confined to Zealand and practically rendered carrot growing impossible there, it has spread further, and particularly in 1920, has done much damage in Jutland. The disease appears after infestation by the carrot Psyllid, *Trioza viridula*.

T. viridula hibernates in the adult stage. In the early summer it attacks the plants and oviposits on them. During July and August the clinging larvae and nymphs feed on the leaves. Leaf curl begins when the first leaves have appeared on the plants.

Spraying with a solution of tobacco as soon as the disease appears has been found effective.

Nakayama (S.). **An Enumeration of the Japanese Aphelininae, with Descriptions of two new Species.**—*Philippine Jl. Sci., Manila*, xviii, no. 1, January 1921, pp. 97–101, 1 plate. [Received 20th July 1921.]

The fourteen known species of Japanese Aphelininae are : *Alberus perspeciosus*, Gir., from *Diaspis* (*Aulacaspis*) *pentagona*, Targ. ; *Aphelinus fuscipennis*, How., from *Aspidiotus perniciosus*, Comst., and *Chionaspis* sp. ; *A. japonicus*, Ashm. ; *A. mytilaspidis*, Le B.,

from *Hemichionaspis aspidistrae*, Sign. ; *Azotus capensis*, How., from *D. pentagona*, Targ. ; *A. chionaspidis*, How., from *Chionaspis difficilis*, Ckll., and *D. pentagona*, Targ. ; *Coccophagus lecanii*, Fitch, from *Ceroplastes rubens*, Mask., *Phenacoccus pergandei*, Cklf., and *Pulvinaria citricola*, Kuw. ; *C. yoshidae*, sp. n., from *Coccus hesperidum*, L.; *Perissopterus mexicanus*, How., from *D. pentagona*, Targ. ; *Prospaltella aurantii*, How., from *Aspidiotus perniciosus*, Comst. ; *P. berlesei*, How., *P. nügatae*, sp. n., and *Archenomus orientalis*, Silvestri, from *D. pentagona*, Targ. ; and *Casca chinensis*, How., from *Chionaspis difficilis*, Ckll.

Palm (B. T.) & Mjöberg (E.). **Bestrijding van Rupsenvraat in Deli-Tabak. iv. Rupsenbestrijding na het Oogsten.** [Measures against Caterpillar Injury to Tobacco in Deli. iv. Combative Measures after the Harvest.]—*Deli Proefstation, Medan*, Vlugschrift no. 10, June 1921, 2 pp.

If the usual remedial measures employed against the caterpillars of *Heliothis*, *Phytometra* (*Plusia*), and *Prodenia*, infesting tobacco [*R. A. E.*, A, ix, 280] are to give the best results, it is necessary to remove all possible breeding facilities after the crop has been harvested. The upper, leaf-bearing portion of each plant should be cut off, so that it may quickly wither on the ground and become unsuitable as food for the caterpillars. Later on, when work is not so pressing on the plantation, the plants must be uprooted and burned. The custom of placing uprooted stems in heaps in the tobacco fields provides the pests with a food supply, especially inside the heaps. Early burning not only helps to keep the caterpillars down, but also removes a source of slime disease, and furthermore, the material yields an ash with a higher potash content.

Wurth (T.). **Verslag omtrent de Werkzaamheden van het Proefstation Malang over 1920.** [Report of the Malang Experiment Station for 1920.]—*Meded. Proefst. Malang, Soerabaya*, no. 34, [? 1921], 17 pp. [Received 21st July 1921.]

An injury to coffee consisting in V-shaped indentations on the twigs, which often caused them to break, appears to be due to a Gryllid depositing its eggs in the twigs. The caterpillars of *Parasa lepida* did some injury, but their collection and that of the cocoons prevented their spread. A Flatid, *Lawana candida*, occurred here and there, but did little injury.

South (F. W.). **Short Report on the Work of the Inspection Staff, Second Half-Year, 1920.**—*Agric. Bull. F.M.S., Kuala Lumpur*, viii, no. 4, October–December 1920, pp. 256–258. [Received 21st July 1921.]

The chief coconut pests were *Oryctes rhinoceros* and *Rhyncophorus ferrugineus*, which were very numerous in different parts of the Peninsula. Field observations and detailed investigations were made, and lectures on the habits of the beetles were given to the head men in various districts. Minor coconut pests included skipper and nettle caterpillars (*Hidari irava* and *Thosea* sp.).

On rice, *Spodoptera mauritia* (army worm), appeared in August, but was kept in check by hand-picking and by a Tachinid parasite. As a remedy for *Podops coarctata*, *Schoenobius bipunctifer* (stem

borer), and *Gryllotalpa* sp. (mole-cricket), spraying with kerosene emulsion and extract of derris root was tried with uncertain results; lamp traps were employed with some success against the stem-borers and mole-crickets.

FROGGATT (W. W.). **A New Mealy Bug on Citrus Trees** (*Pulvinaria ornata*, **n. sp.**).—*Agric. Gaz. N.S.W., Sydney*, xxxii, pt. 6, June 1921, pp. 427–428, 1 plate.

Pulvinaria ornata, sp. n., was found in all stages of development on the foliage of a lemon tree near Sydney, and also heavily infesting the foliage of *Pittosporum undulatum*, near the lemon tree. It is assumed that this bush is the original host of this Coccid.

Of the *Pulvinaria*, the most common and widely distributed is *P. psidii*, which is found on guavas in the Sandwich Isles; on guavas, figs and *Eugenia* in the Philippines; and on guavas, mango, tea and coffee plants in Southern India. The plants are covered with cotton ovisacs, and much honey-dew is produced. *P. tecta* is known to feed on orange foliage in Sydney, and on *Acacia* and *Davesia* near Sydney and Melbourne. In Ceylon, citrus fruits are infested with *P. cellulosa*. The new bug here described closely resembles these three species, especially the latter.

ILLINGWORTH (J. F.). **A Study of Natural Methods of Control for White Grubs.**—*Queensland Bur. Sugar Expt. Sta., Brisbane*, Div. Ent., Bull. 12, 1921, 20 pp., 5 figs. [Received 21st July 1921.]

Investigation into the condition of white grubs in sugar-cane areas in Queensland showed that, on the estate examined, about one-third of the grubs had recently succumbed to Muscardine fungus [*Metarrhizium anisopliae*]. In consequence of this discovery it was decided, towards the end of 1918, to try artificial propagation of the spores. The method of propagation is described: maize meal and sliced sweet potatoes proved the best media for cultivation. The results of inoculation of fields with the fungus were, however, very inconclusive, largely owing to the fact that a real epidemic of the fungus occurred in 1920 in all the grub-infested area, so that the majority of the grubs were killed without any artificial assistance. Under normal conditions the grubs descend into the soil for hibernation in March or April, before the cool weather sets in, and when they are thus located, deep in the moist sub-soil, they seem to be fairly immune from diseases. Investigations showed that mortality increased with the lowering of the temperature, and was also stimulated by moisture; both of these factors were present during the 1920 epidemic. It was also found that the fungus was well distributed in all the areas regularly attacked by grubs, but did not occur outside this well-defined region. Apparently, the disease spores persist in the soil, ready to bring about an epidemic when conditions are favourable. It is therefore likely that the action of the fungus can easily be increased by irrigating the fields, especially after cool weather sets in, which is usually in the dry season.

Another cause of mortality among the grubs is a bacterial organism, apparently the same as that previously described as *Micrococcus nigrofaciens*. It is difficult to gauge the rate of mortality from this disease as the affected grubs quickly decompose and disappear. Bacterial contagion is far less destructive than Muscardine fungus

under the same conditions. The two are often present together, however, and the same conditions of moisture and low temperature are favourable to both. Grubs attacked by bacterial disease readily succumb to the fungus. It would certainly seem worth while to inoculate the soil of all grub-infested land with the fungus. The inoculation of uninfested land is not advocated, for the fungus probably depends upon grubs and other insects in the field for its sustenance. Inoculation may be made by removing a shovelful of earth and dropping in a pinch of spore-laden soil, at least once in each chain of the field. When a field is ploughed a small quantity of inoculating soil could be dropped at about every tenth row in the furrows.

It is suggested that investigation might be made regarding two species of grub-destroying bacteria that occur in Java, and others that are known in the Philippine Islands and elsewhere, with a view to their introduction into Queensland.

ILLINGWORTH (J. F.). **The Cane Grub.**—*Queensland Agric. Jl., Brisbane,* xv, pt. 6, June 1921, pp. 280–281.

A sugar-cane pest, reported as *Rhabdocnemis obscura,* Boisd., in May 1921, proved to be *Phragmatiphila truncata,* Walk., a native moth borer, which is usually checked by the Hymenopterous parasites *Apanteles nonagriae,* Olliff, and *Euplectrus howardi,* Olliff. Artificial control measures were not advisable, as the pest was only seen in old standover canes, and was doing little damage.

In sandy-loam fields near the river, *Mastotermes darwiniensis,* Froggatt, was found, but it is fortunately not widely distributed. It removes the pithy contents of long sticks from top to bottom, leaving only the rind, which supports the green leaves. It is a notorious devastator in the Northern Territory, where no cane can be grown, and even large trees are hollowed out and ring-barked.

In some districts, ibises (*Carphibis spinicollis,* Reich., and *Ibis molucca,* Cuvier) and crows (*Corvus australis*) followed the ploughs and destroyed grubs and earth-worms. The ibises breed in great colonies near the mouth of the Haughton River, thus accounting for the scarcity of grubs in these districts. Unfortunately, in the Cairns district they are absent from February to June, when they would be of great service, and the crows do not occur at all.

MORSTATT (H.). **Ueber einige Ergebnisse der Termitenforschung.** [Some Results of Research on Termites.]—Reprint from *Biol. Zentralblatt* [*sine loco*], xl, no. 8–9, 1st August 1920, pp. 415–427.

The observations here described were chiefly made in East Africa.

It appears that the larger termites, *Termes goliath, T. bellicosus,* and *T.* (*Odontotermes*) *badius,* normally feed on wood that is almost dry, though a little moisture (even dew may suffice) must be available. Attacks on fresh, growing wood also, causing serious injury in plantations, chiefly to bark and sapwood, have been observed in the case of *T. bellicosus, T. badius, T. natalensis,* and *Acanthotermes militaris.* The reason for these attacks is unknown, perhaps they are connected with severe droughts.

Termites often attack young cuttings, the infestation beginning at the cut surface; and on one occasion banana leaves lying on the ground were found to have been eaten by the wood-destroying *Acanthotermes spiniger* during the night.

Though not avoiding it, termites usually live away from light, probably because they need humidity in a warm, and usually very dry, climate.

Bovell (J. R.). **Insect Pests and Fungoid Diseases, etc.**—*Rept. on the Dept. Agric., Barbados, 1918–19,* 1921, pp. 22–27. [Received 22nd July 1921.]

The legislation for the year under review in regard to cotton has been superseded by another order, which has already been noticed [*R. A.E.*, A, ix, 330].

The injury caused by *Diaprepes abbreviatus,* L. (root borer), and *Lachnosterna* (*Phytalus*) *smithi,* Arr. (brown hard-back), has increased, and rendered valueless the manurial experiments carried out with sugar-canes and seedling sugar-canes. Figures showing the average number of these two pests and of *Tiphia parallela* collected on various estates are given.

Experiments carried out during the harvest of 1919 prove that *Diatraea saccharalis,* F. (moth borer) attacked an average of 94·87 per cent. of the canes. *Trichogramma minutum* (*pretiosum*) and an unidentified egg parasite heavily parasitise this pest, and egg batches that are found should be cut off and kept, so that the parasites may emerge.

In 1917, sugar-canes on one estate were considerably damaged by the larvae of *Cirphis microgonia,* Hmp., but they were controlled by the parasite *Peleteria robusta,* Wied.

Minor sugar-cane pests include ants of the genus *Rhizomyrma, Pulvinaria longulus, Pseudococcus sacchari,* and *P. calceolariae,* the latter being checked in many cases by the larvae of *Hyperaspis trilineata,* Muls., and a fungus of the genus *Aspergillus.*

Alabama argillacea and *Anomis* (*Aletia*) *luridula* were the only serious pests of cotton this year, and they could have been controlled by timely dusting with Paris green. Attacks by *Porricondyla gossypii,* Coq., were only negligible. The usual quantity of *Eriophyes gossypii* were seen, but there has been no record of this pest attacking cotton.

Provision crops were attacked in the drier districts by *Euscepes batatae,* Waterh. More care should be taken to plant only healthy cuttings. *Tetranychus telarius,* L., and a species of thrips were also recorded as doing damage. On several occasions young sweet potato plants were destroyed by slugs (probably *Veronicella occidentalis*). *Thrips tabaci* attacking eschalots were successfully controlled by soap and Black-leaf 40.

Nematodes were found attacking mahogany trees, causing gnarled and contorted conditions of the basal portions of the trunk. The remedial measure recommended is the removal of all bark from half of the trunk to the cambium layer, and painting the exposed part with lime-sulphur mixture, thickened with clay. After two months, when this portion is in a healthy condition, the other half should be so treated. Each half should be painted over three times.

Other insects found during the year included: *Camponotus* sp. on mahogany trees, *Sitodrepa panicea,* L., attacking onion seed, *Zygops histrio,* Boh., found among books, *Phileurus valgus,* L., *Attagenus gloriosae,* F., *Heteroderes laurenti,* Guér., *Phaleria chevrolati,* Fl. & S., *Tabanus hookeri,* Towns., found on an okra plant, *Drosophila melanogaster,* Mg., bred from decaying mangos, *Sarcophaga ventricosa,* Wulp, found on Indian corn, *Hemiberlesea longispina,* Morg., attacking *Carica papaya* (papaw tree), the male and its puparium not having been hitherto discovered, and an unidentified Chalcid parasite.

NOTICES.

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THE REVIEW OF APPLIED ENTOMOLOGY

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Os Insectos damninhos. xvi. O Gorgulho do Coqueiro, *Rhynchophorus palmarum,* **L.** [Injurious Insects. xvi. The Coconut Weevil, *R. palmarum.*]—*Chacaras e Quintaes, S. Paulo,* xxiii, no. 6, 15th June 1921, pp. 467–468, 2 figs.

The injury done by *Rhynchophorus palmarum,* L., to coconut palms in Brazil is of far less importance than that done by rhinoceros beetles and similar species. It should, however, be combated energetically. The head of the palm may be well sprayed with a solution made by mixing borax 10 lb., unrefined sugar 10 lb., and boiling water 5 gals. Other sprays are arsenious anhydride, carbon bisulphide, or petroleum. As *R. palmarum* is not limited to the coconut palm, other palms should be watched, as they may become dangerous breeding places.

Moreira (C.). **Algumas Pragas do Coqueiro.** [Some Coconut Pests.]—*Chacaras e Quintaes, S. Paulo,* xxiii, no. 6, 15th June 1921, pp. 470–471.

Beetle pests of the coconut received from the State of Bahia have been identified as a Longicorn, *Ctenoscelis acanthopus,* Germ., hitherto unknown as a coconut pest, and a Hispid, *Mecistomela* (*Coraliomela*) *corallina,* Vigors.

Smith (G. D.). **Studies in the Biology of the Mexican Cotton Boll Weevil on Short-staple Upland, Long-staple Upland and Sea Island Cottons.**—*U.S. Dept. Agric., Washington, D.C.,* Bull, 926, 19th April 1921, 44 pp., 1 plate, 18 figs. [Received 22nd July 1921.]

A study has been made of the biology of *Anthonomus grandis,* Boh. (Mexican cotton boll weevil) occurring east of the Mississippi river, and the results of many tests and observations are given in a series of tables. Most of the investigations were made at Madison, Florida. It was found that there was practically no difference in the longevity of weevils on sea-island and upland cottons, nor in their developmental period either in short-staple or long-staple upland, or in sea-island cotton squares. Soil temperatures of 120° F. and higher usually proved fatal to immature weevils under field conditions. *A. grandis* in this locality shows a decided tendency to form a new variety. The hibernation of the weevils is incomplete, and the adults are seldom inactive for more than thirty days at a time. Emergence from hibernation is very gradual, the total daily emergence bearing a direct relation to the total daily rainfall. The total percentage of hibernating weevils that survived the winter of 1918–1919 in Madison, Florida, was 7·54.

Davidson (W. M.) & Nougaret (R. L.). **The Grape Phylloxera in California.**—*U.S. Dept. Agric., Washington, D.C.,* Bull. 903, 22nd April 1921, 128 pp., 10 figs., 11 plates. [Received 22nd July 1921.]

The history and distribution of *Phylloxera vitifoliae,* Fitch, in California are reviewed. The nomenclature and synonymy are also dealt with and the various stages are described. The life-cycle in California is probably purely parthenogenetic, and therefore greatly

modified from the original cycle occurring on wild vines. The winter is only passed in one form, the hibernating larva, which is found on the roots and occasionally on the trunk beneath the bark. When mature this form gives rise to generations of radicicolae, the Aphids that issue from eggs in the autumn hibernating. Owing to various influences, such as temperature, food, variety of vine, etc., some of the radicicolae develop into winged migrants and issue from the ground. The root-feeding larvae also reach other vines by way of the soil surface or subterranean cracks, etc. The injury caused to vines and the methods of distributing the pests are discussed at length.

CAFFREY (D. J.). **Biology and Economic Importance of** *Anastatus semiflavidus*, **a recently described Egg Parasite of** *Hemileuca oliviae.*—*Jl. Agric. Res., Washington, D.C.*, xxi, no. 6, 15th June 1921, pp. 373–384, 1 plate, 3 figs.

Anastatus semiflavidus, Gah., appears to be one of the most efficient natural enemies of *Hemileuca oliviae* in New Mexico. It has also been found parasitising eggs of *H. nevadensis*, Stretch, on willow, and this moth may prove a useful host for perpetuating the species. Attempts to rear the parasite on eggs of *Malacosoma fragilis*, Stretch, collected from scrub oak, were not successful. Under field conditions oviposition occurs in the middle of September, as soon as the eggs of the host have been deposited, and continues until the advent of severe winter weather. It is thought probable that the earlier eggs hatch and hibernation takes place as a partly developed larva within the host, whereas those deposited later in the season overwinter in the egg stage. The length of the larval period is uncertain, varying in some observations from about seven months to two years. The development of the pupal stage depends largely upon external climatic conditions; thus, should a full-grown larva be subjected to a long period of drought, pupation may be delayed, and a dormant larval period of indefinite duration be produced, until both humidity and temperature are favourable for further development. After a very short pupal period the adults emerge. Only one parasite develops in each egg. Each female produces about 60 or more individuals. Adults are found in the field from early May to early December, the maximum emergence occurring in July and August. From one series of observations the total life-cycle is estimated at an average of 380 days, with a minimum of 226 and a maximum of 449 days.

PHILLIPS (W. J.) & POOS (F. W.). **Life-history Studies of three Jointworm Parasites.**—*Jl. Agric. Res., Washington, D.C.*, xxi, no. 6, 15th June 1921, pp. 405–426, 6 plates, 16 figs.

Ditropinotus aureoviridis, Crawf., and *Homoporus chalcidiphagus*, Walsh & Riley, are primary parasites of *Harmolita tritici*, Fitch, and have a similar distribution to the host. *Eupelmus allynii*, French, is both a primary parasite and hyperparasite of the same host, and is commonly found wherever the Hessian fly, *Mayetiola* (*Phytophaga*) *destructor*, Say, and the majority of *Harmolita* spp. are found.

The chief host of the Torymid, *Ditropinotus aureoviridis*, besides *H. tritici*, is *H. vaginicola*, Doane, and it has been reared in cell slides from *H. elymicola*, Phillips & Emery, and from field collections of *H. grandis*, Riley, *H. atlantica*, Phillips & Emery, and *H. secalis*, Fitch. It also breeds freely on the larvae of *Eurytoma* spp.

The eggs are deposited in the gall-like cells of *H. tritici* external to the host. The average incubation period is about three days. Several parasites may be found on one jointworm, but only one ever completes its development. Larvae reared in glass cells become fully grown in from 6 to 24 days, with an average of about 11 days. The prepupal stage lasts from 1 to 6 days, with an average of 2 days, and the pupal stage from 8 to 15 days, with an average of 10 days. Normally, no males occur in the first generation, and the females greatly outnumber them in the succeeding generations. The winter is passed as a full-grown larva in the cells of *Harmolita*, the first generation emerging about June and the second in July in Virginia. The occurrence of a partial third generation under field conditions has still to be proved. Many larvae of the first generation do not pupate the same season. Should the host of *D. aureoviridis* be heavily parasitised the latter may become a hyperparasite.

Next to *D. aureoviridis*, the Pteromalid, *Homoporus chalcidiphagus*, is the most important parasite of *H. tritici* in Michigan, Illinois, Indiana, Ohio, Kentucky, Tennessee, and Missouri, although in the Atlantic States *Eurytoma* sp. is probably of greater importance. Although in certain districts as many as five generations occur annually, their numbers are greatly reduced by hyperparasites, which include *Eupelmus allynii* and *D. aureoviridis*. *Homoporus chalcidiphagus* has been reared from field collections of *Harmolita tritici*, *H. vaginicola*, *H. secalis*, *H. hordei*, Harris, *H. elymicola*, and *H. atlantica*. The eggs are always found external to the host, as many as four or five being laid in one cell; but only one of these completes development. In glass cells the incubation period varied from 1 to 4½ days, with an average of 2½ days. The larvae become fully grown in from 5 to 25 days, the average being about 11 days. Many larvae when fully grown become quiescent for many months. The winter is passed as a fully grown larva in the cells of the jointworm. The prepupal stage varies from 1 to 6 days, with an average of 2 days; the pupal stage 5 to 23 days, with an average of from 9 to 10 days. In Virginia the adults emerge during the latter part of May and continue breeding until October. Normally, the proportions of the sexes are about equal, but parthenogenetic breeding may occur, in which case the offspring are males.

Eupelmus alynii will probably breed on any species of *Harmolita*, and as a hyperparasite was found breeding on *Ditropinotus aureoviridis*, *Homoporus chalcidiphagus*, and *Eurytoma* sp. As with the other parasites the egg is always deposited externally to the host. The average incubation period is 2·4 days; the larval stage averages 16 days, the prepupal stage 1·7 days, and the pupal stage 21 days. The winter is passed in the larval stage, and the adults emerge at the end of April or beginning of May in Virginia. *E. alynii* is also a parasite of the Hessian fly [*Mayetiola destructor*]. These parasites can only be relied upon for partial control of *Harmolita tritici* owing to heavy hyperparasitism.

Byars (L. P.). **Notes on the Citrus-root Nematode,** *Tylenchulus semipenetrans*, **Cobb.**—*Phytopathology, Baltimore, Md.*, xi, no. 2, February 1921, pp. 90–94, 1 fig.

Tylenchulus semipenetrans, Cobb, is recorded as infesting nursery stock of *Citrus* in Florida. There are apparently no symptoms by which the presence of the parasite is indicated. Hot water treatment

proved effective when the roots were immersed in water with a higher temperature than 120° F. for 15 minutes. The hot water apparently had a detrimental effect on the growing plants, but in the winter the plants could probably withstand higher temperatures and longer exposures.

Morse (W. J.). **The Transference of Potato Late Blight by Insects.**—*Phytopathology, Baltimore, Md.,* xi, no. 2, February 1921, pp. 94–96.

A case of late blight on potatoes is described in which the flea-beetle, *Epitrix cucumeris,* Har., and *Macrosiphum solanifolii,* Ashm. (potato Aphid), are suspected as mechanical carriers. No positive evidence was obtained of the spores of the fungus adhering to the Aphids; but the flea-beetle may act as carrier, though it does not always do so, when taken from plants producing an abundance of the conidia of late blight.

Weiss (H. B.). **Notes on the Larval and Pupal Stages of** *Xyloryctes satyrus,* **Fab. (Col. Scarabaeidae).**—*Ent. News, Philadelphia, Pa.,* xxxii, no. 7, July 1921, pp. 193–198, 1 plate.

The larvae and pupae of the rhinoceros beetle, *Xyloryctes satyrus,* F., are described from individuals that have recently been reared, and notes of various authors on the larval habits are collated.

Eyre (J. R.). **Rearing Anthomyiid Root Maggots on Artificial Media (Dipt.).**—*Ent. News, Philadelphia, Pa.,* xxxii, no. 7, July 1921, pp. 215–216.

Experiments with *Hylemyia antiqua,* Meig. (onion maggot) and *H. brassicae,* Bch. (cabbage maggot) have demonstrated that these species can be successfully reared on agar jelly containing a high per cent. extract of the larval food-plant. The method of rearing is described. Owing to the transparency of the agar, the development of each instar can be observed.

Severin (H. C.). **The Webspinning Sawfly of Plums and Sandcherries.**—*South Dakota Agric. Expt. Sta., Brookings,* Bull. 190, September 1920, pp. 222–251, 12 figs. [Received 25th July 1921.]

The information contained in this bulletin on *Neurotoma inconspicua* has been previously noticed [*R.A.E.,* A, ix, 236].

Entomology: Work and Progress of the Agricultural Experiment Station for the Year ended December 31st 1920.—*Idaho Univ. Agric. Expt. Sta., Moscow,* Bull. 122, January 1921, pp. 33–41, 1 fig. [Received 25th July 1921.]

Close grazing as late as the first week in July or cutting back between the 1st and 15th of that month will destroy from 80 to 95 per cent. of the clover aphis [*Anuraphis bakeri*] without materially reducing the number of natural enemies. *Tylenchus dipsaci,* Kühn., caused serious injury to clover in certain districts. Heavy infestations of the alfalfa weevil [*Hypera variabilis*] are recorded, against which dusting is likely to prove more satisfactory than spraying.

It was found that the first brood of the codling moth [*Cydia pomonella*] emerged over a long period. Five sprays were necessary, viz., the calyx spray, the second application just before the maximum emergence of the larvae of the first brood, the third about three weeks afterwards, a fourth at the beginning of the emergence of the larvae of the second brood, and the last about three weeks later. If the warm weather continues as late as August and September, an additional spray just before picking time may be advisable.

A number of standard sprays were tested against the San José scale [*Aspidiotus perniciosus*], all of which proved very effective. A large number of the scales were killed by adverse climatic conditions.

WAKELAND (C.). **Fighting Alfalfa Weevil.**—*Idaho Univ. Extens. Div., Boise,* Extens. Bull. 50, March 1921, 27 pp., 9 figs. [Received 25th July 1921.]

This paper deals fully with the life-history of and control measures against *Hypera* (*Phytonomus*) *variabilis* (alfalfa weevil), and the damage to crops in Idaho by this pest. The bulk of the information has already been noticed [*R. A.E.*, A, vi, 339; ix, 166].

Spraying with 2 lb. calcium arsenate to 100 U.S. gals. water per acre has proved the most satisfactory remedial measure.

The Ichneumonid larval parasite, *Bathyplectes curculionis*, introduced from Europe, is rapidly spreading, but cannot be relied on for complete control. There is at least a partial second generation of the parasite. If the other natural enemies that control this pest in Europe could be successfully introduced into Idaho, they might prove more effective.

WEISS (H. B.). **The Gipsy Moth** (*Porthetria dispar*, **L.**).—*New Jersey Dept. Agric., Bur. Statistics and Inspec., Trenton, N.J.,* Circ. 38, May 1921, 17 pp., 9 figs.

Porthetria dispar, L. (gipsy moth) was first discovered in New Jersey in 1920. Since November of that year, at least one hundred men have been continuously at work in the State carrying out suppression measures. The most severely infested areas have been cut and burned. The number of egg clusters treated with creosote in various townships is listed, and spraying has been thoroughly executed.

Much information on the seasonal history, food-plants, injury, parasites and control of the gipsy moth is quoted from Farmer's Bulletin 345 of the U.S. Dept. Agric.

LOFTIN (U. C.), MCKINNEY (K. B.), & HANSON (W. K.). **Report on Investigations of the Pink Bollworm of Cotton in Mexico.**—*U.S. Dept. Agric., Washington, D.C.,* Bull. 918, 19th April 1921, 64 pp., 5 plates, 11 figs. [Received 22nd July 1921.]

An account is given of *Platyedra* (*Pectinophora*) *gossypiella* (pink bollworm of cotton) as occurring in Mexico, where about 25 per cent. damage is done in the Laguna district. The remedial measures advocated include early cleaning of the fields by burning all the old stalks and bolls, the cleaning and fumigation of gins, oil mills, and seed warehouses, the fumigation of all seed kept on the plantations, and the early maturing of the crops.

In an appendix, Busck's description of the various stages is quoted, with illustrations.

LOFTIN (U. C.). **Apuntes sobre la Vida del Gusano rosado.** [Notes on the Life-history of *Platyedra gossypiella*.]—*Rev. Agric., San Jacinto, D.F., Mexico,* v, no. 1, 1st September 1919, pp. 68–69. [Received 25th July 1921.]

A study has been made of keeping larvae of the pink bollworm of cotton [*Platyedra gossypiella*] under various conditions during the winter. It was found that no larvae remained alive after 24th April in the bolls buried in moist ground, about 6 in. deep, while 10 per cent. of those buried in dry ground survived until 4th June. Of those left in the bolls above-ground, 45 per cent. remained alive. Burying the stubble and irrigating the soil is, therefore, a sure method of destroying the bollworms, and ploughing in the autumn also largely reduces their numbers. Of larvae kept in the laboratory and examined up to the 30th June, 3·3 per cent. of those kept in a meteorological case in the open air had already hatched, 9·2 per cent. of those enclosed in the double seed in which they were found, and 35·8 per cent. of those taken out of the seed and enclosed in a glass case with a little cotton.

Cotton began to bloom on 17th May, and from that date onward infestation increased irregularly during the month, the percentage of infestation decreasing owing to the rapid appearance of the blossoms. During the last days of June, the infestation notably increased, probably owing to the appearance of larvae of the second generation. The life-history under Mexican conditions was as follows: adult life before oviposition, 2–8 days; oviposition period, 4–8 days; larval period, 10–17 days; pupal period, 10–17 days; or 23–33 days [*sic*], with an average of 30 days for the whole life-cycle. The second generation begins to appear during the last days of June, but from this date onwards the broods are so intermingled that it is almost impossible to distinguish them.

Experiments showed that larvae separated from the bolls and submerged survived for 48 hours, while those in submerged bolls survived for 7 or 8 days; there is, therefore, a danger of the larvae spreading greatly during the irrigation period. Carbon bisulphide at the rate of 1 lb. per 80 cu. ft. has given very good results in disinfection of the seed. It penetrates a mass of seed to a depth of 5 ft., while hydrocyanic acid gas will not penetrate more than a few inches into the mass.

RAMIREZ (R.). **Plagas de algunos Arboles Frutales.** [Pests of certain Fruit-trees.]—*Rev. Agric., San Jacinto, D.F., Mexico,* vi, no. 1, May 1921, p. 43.

Aspidiotus perniciosus (San José scale) is recorded from the Federal District of Mexico as a serious pest of chabacanos (Mexican apricots), peach, plum, pear, and apple trees. A fungus of the genus *Sporotrichum* develops on the scales, but has not been found actually within the body of the insect. The Acarine, *Tetranychus sexmaculatus,* attacks apricots and apple trees.

Un Parasito de la Caña de Azucar, y un Insecto destructor de las Hojas del Chile. [A Parasite of Sugar-cane and an Insect destructive to the Leaves of Chili.]—*Rev. Agric., San Jacinto, D.F., Mexico,* vi, no. 1, May 1921, p. 47.

Pseudococcus (Dactylopius) sacchari is reported on sugar-cane in Mexico. Irrigation with paraffin and gasolene, or water containing

calcium polysulphide is recommended when infestation is first noticed. Badly infested canes should be burnt. *Epitrix cucumeris*, of which potato leaves seem to be the preferred food, attacks the leaves of chili plants. One part of Paris green or London purple mixed with two parts of lime dusted on the leaves is suggested as a remedy.

SMITH (L.). **Sea Island Cotton in St. Croix.**—*Virgin Islands Agric. Expt. Sta., St. Croix*, Bull. 1, 23rd May 1921, 14 pp., 2 plates.

In the course of this bulletin on the cultivation of cotton in St. Croix the various diseases and the following insect pests are briefly dealt with: *Dysdercus andreae, Nezara viridula, Alabama argillacea, Eriophyes gossypii, Heliothis obsoleta, Prodenia ornithogalli, P. latifascia, Laphygma frugiperda, Xylomyges sunia, Platyedra* (*Pectinophora*) *gossypiella* (which has just been recorded on the Island), cutworms, and the cotton aphis [*Aphis gossypii*].

MASON (F. A.). **Pests and Diseases of Barley and Malt. Part I, Injurious Insects.**—*Jl. Inst. Brewing, London*, xxvii, no. 7 (N.S., xviii), July 1921, pp. 346–383, 8 tables.

A general account is given of the insects attacking barley in the field as well as when stored. Remedial measures are discussed and previous works are extensively quoted. With regard to the control of pests in stored products the necessity for careful inspection of imported barley is especially emphasised.

SIGNORINI (M.). **Phylloxera in Italy and the best Grafting Stock.**—*Giorn. Vin. Ital., Casale Monferrato*, xlvi, no. 5, 1st February 1920, pp. 37–39. (Abstract in *Internat. Rev. Sci. & Pract. Agric., Rome*, xi, no. 6, June 1920, pp. 752–753.) [Received 25th July 1921.]

A list is given of the most suitable grafting stocks for different parts of Italy that are considered to be sufficiently resistant to *Phylloxera*.

VIVARELLI (L.). **A Dipteron injurious to the Almond Tree in Apulia, Italy.**—*La Propaganda Agrícola, Bari*, Ser. ii, xii, no. 3, 13th February 1920, pp. 26–27. (Abstract in *Internat. Rev. Sci. & Pract. Agric., Rome*, xi, no. 6, June 1920, p. 802.) [Received 25th July 1921.]

A Cecidomyiid is recorded as attacking blossoms of the almond tree in Italy and causing them to drop. This infestation is probably accidental. The fallen flowers should be burnt to prevent further development of the larvae.

FINTZESCU (G. N.). *Hoplocampa fulvicornis*, **Fabr. La Mouche-à-scie des Prunes. Note préliminaire.**—*Bull. Sect. Sci. Acad. Roumaine, Bucharest*, vii, no. 1–3, 1920–21, pp. 42–45.

The adults of *Hoplocampa fulvicornis*, F., emerging in the spring, deposit their eggs on the calyx of the flowers of apricots and plums. Incubation depends on climatic conditions; during 1916 the larvae emerged after 12 days, but in 1920 after 6 days. They remain at the point of their emergence until they are able to enter the fruit, when they feed on the mesocarp. After about 4 to 8 days an exit hole is

made, and another fruit attacked. Only the kernel of the second fruit is eaten; when fully grown, after 12–16 days, the larva gnaws a tunnel towards the stem of the fruit, causing it to fall, and then enters the soil and remains in a cocoon until the following spring, when it pupates. *H. fulvicornis* has also been found in pears.

The Cultivation of Sugar-cane and Manufacture of Cane Sugar.—*Bull. Imp. Inst., London,* xix, no. 1, 1921, pp. 26–59.

In the course of this paper a chapter is devoted to pests and diseases of sugar-cane, and some of the usual remedial measures against them are quoted. The noxious insects are tabulated, the common and scientific names, distribution, part of plant attacked, and preventive and remedial measures being given.

Departmental Activities: Entomology.—*Jl. Dept. Agric. Union S. Africa, Pretoria,* iii, no. 1, July 1921, pp. 12–16.

Drought and other unfavourable conditions have so depleted the apple-tree nurseries that the prohibition on blight-proof stocks has been suspended for the present season, though the introduction permits are subject to certain restrictions. Fruit moths have been unusually injurious, the chief species being *Achaea catella* and *A. lienardi.* Fresh hatchings of locusts have been reported during May on a number of farms: it is pointed out that as it is far less troublesome and expensive to destroy the recently hatched locusts than those more fully grown, it is very much in the farmer's interest to assist the Government with information as to where hatchings are to be expected, and otherwise to carry out his obligations.

In the Eastern Province it has been found necessary to use spraying as a remedy for *Acanthomia tomentosicollis* (bean bug), *Epilachna similis,* and *Crocidolomia binotalis* (larger cabbage moth). The fruit-piercing moths, *Sphingomorpha chlorea* and *Achaea catella,* destroyed as much as half the crop of apples in the Bathurst district during March and April, and the caterpillars were abundant on native bushes. The larvae of *Parasa latistriga* injured *Eucalyptus rostrata* and *Acacia cyclopis,* which is one of the principal trees in the sand belt near Port Elizabeth. *Pseudococcus bromeliae* (pineapple mealybug) was abundant, but was less numerous in well-cultivated fields where the surface was in fine tilth; this is probably because ants, which are largely instrumental in transferring the mealybugs, find it difficult to travel over such soil.

In Zululand, *Zonocerus elegans* was very abundant in cotton fields. A poison bait that has been found successful in Portuguese East Africa —banana pulp and sodium arsenite—was employed. After a few days, however, this bait ceased to be attractive and sugar-cane was substituted for the banana-pulp, with very good results.

Termites of the fungus-growing type are common, and the usual method of dealing with them is to dig out and destroy the queen. When this is done, however, the community does not necessarily die out, as was supposed, but frequently chooses another queen and continues the same colony. Instances are given of this occurring in the case of *Macrotermes natalensis* and *Termes badius,* while in regard to *T. angustatus,* a queen was found in a nest that was known to be

forty or fifty years old. Cultivated buchu plants in Cape Province were found to have rotted away and the stems were riddled by galleries of *Eutermes* sp., but whether the termites were the cause of death of the plants is uncertain.

Pest Remedies—Insecticides and Fungicides. Draft Regulations.—*Jl. Dept. Agric. Union S. Africa, Pretoria,* iii, no. 1, July 1921, pp. 61–63.

Certain proposed regulations (under Act no. 21 of 1917) which are to be enforced from 1st January 1922, with regard to the sale of insecticides and fungicides, are given verbatim. The Department of Agriculture is prepared to consider any representations submitted in regard to any clause embodied in these draft regulations, which are to the following effect: No pest remedy other than registered stock dips shall be sold unless the container shows the minimum net weight or volume, the correct name of the composition, the minimum percentage of all ingredients for which efficacy is claimed, and under the term "inert ingredients," the maximum percentage of such, collectively or separately, when they exceed 5 per cent. The percentage amount shall be by weight in solid remedies, and in grammes per 100 cc. in liquid remedies. A semi-fluid remedy, if recommended for use on a volumetric basis, shall be regarded as a liquid, but as a solid if for use on a gravimetric basis.

No remedy shall be sold concerning which any false or misleading statements in respect of any material particular is made on any printed or written publication accompanying the container, or in any notice or advertisement of the remedy.

No pest remedy containing arsenic, other than registered stock dips, shall be sold unless it shows the combination of the arsenic with any metal or other base, and the percentage amount of each compound. The minimum percentage amount of total arsenic is to be expressed in terms of element arsenic, as is also the maximum percentage amount of water-soluble arsenic.

No person shall sell as Paris green any pest remedy other than that known as aceto-arsenite of copper, or which does not contain in the form of arsenic trioxide the equivalent of 37½ per cent. of the element arsenic, or which contains over 2½ per cent. of water-soluble arsenic.

Lead arsenate shall not be sold, under any term, unless it is derived from arsenic acid by replacing one or more hydrogen atoms by lead; contains arsenite pentoxide, the equivalent of 16 per cent. of the element arsenic; and does not contain more than 1 per cent. water-soluble arsenic.

Sulphur, unless in a finely divided state, shall not be sold as a pest remedy, and the container must specify whether the article is ground sulphur, flowers of sulphur, or milk of sulphur, and the minimum degree of fineness by Chancel's test.

No person shall sell as copper or cupric sulphate, sulphate of copper, bluestone, blue vitriol, or blue copperas, or any such names, any pest remedy that does not contain 60 per cent. anhydrous copper sulphate.

No pest remedy, other than registered stock dips, shall be sold in which sulphur is combined with calcium, sodium, potassium, or other basic elements, forming therewith a water-soluble sulphide, unless the container shows the minimum percentage amount of sulphur

present in water-soluble sulphide form, and the maximum percentage amount of each basic element with which sulphur is combined in this form.

No pest remedy containing nicotine as an ingredient, other than registered stock dips, shall be sold unless the container shows the minimum percentage amount of contained nicotine.

Cyanide shall not be sold as a pest remedy unless the container shows the total percentage of cyanogen contained in the cyanide, the forms of combination in which cyanogen is present, and the minimum percentage of each form.

For the purposes of these regulations the percentage of arsenic in water-soluble condition in a pest remedy shall be as determined by the amount present in solution after a sample of the preparation has been digested for 24 hours at a temperature of 32° C. in a quantity of water 500 times the water-free weight of the sample.

Notwithstanding any provision to the contrary, pest remedies, other than stock dips, may be sold if they have deteriorated through exposure or other ways, if the container is marked "damaged."

Persons contravening the regulations shall be fined not more than £10.

The prescribed tariff for the analysis of pest remedies referred to in Section 24 of the Act shall be one guinea for a determination of any constituent, with a maximum of five guineas per sample.

MARSHALL (G. A. K.). **On twelve new Species of Curculionidae from South Africa.**—*Ann. & Mag. Nat. Hist., London,* viii, no. 44, August 1921, pp. 145–160.

The species dealt with include *Eremnus cerealis*, sp. n., causing considerable damage to wheat and oats in the Cape Province.

Keys are given to the South African species of *Microlarinus*, Hochh., and *Hypsomus*, Schh.

HUTSON (J. C.). **Scale Insects and Mites upon Tea.**—*Trop. Agric., Peradeniya,* lvi, no. 6, June 1921, pp. 378–380.

The following pests on tea were found on two inland estates in Ceylon: *Saissetia hemisphaerica* (brown bug), *S. oleae, Coccus viridis* (green bug), *Tetranychus bioculatus* (red spider), *Eriophyes* (*Phytoptus*) *carinatus* (purple mite) and *Tarsonemus translucens* (yellow mite). *S. hemisphaerica* was the most important pest; *S. oleae* is not usually found on tea.

The infested bushes were conspicuous owing to the presence of sooty mould (*Meliola* sp.). This fungus is a marked feature of an attack of *S. hemisphaerica* or *C. viridis,* but is only of secondary importance. No parasitic Hymenoptera were present and only a few Coccinellids. The greyish-white fungus (*Cephalosporium lecanii*) was the chief parasite of the scales.

Some larval forms of *S. oleae* were found on vigorous shoots in a field where neither *S. hemisphaerica* nor *C. viridis* occurred, but they had caused no appreciable damage. In one area the bushes, which had been pruned the previous year and the prunings burnt, were re-infested with *C. viridis*. The scales and mites often occurred in slight hollows, wind-swept slopes, and in strips along the edges

of roads, and attacks by these pests usually indicate weakness of the bushes due to unfavourable conditions, such as poor soil, inadequate drainage, deficiency in manuring, or excess of nitrogenous manures, which produce vigorous-looking bushes, but with insufficient vitality to withstand attacks. In this connection attention is drawn to recent investigations in Assam in regard to soil manuring to control *Helopeltis* [*R.A.E.*, A, viii, 204].

Manure on many estates is only applied at two or three-year intervals, after pruning, but it would be better if smaller doses were applied more frequently. Special attention should also be given to the question of drainage in areas where these pests are prevalent every year. These methods have a more permanent effect than insecticide spraying.

For severe attacks in small areas, the bushes may be pruned, the prunings burnt, and the bushes sprayed with kerosene emulsion.

Hernandez (A.). **Plant Pests Control Division.**—*20th Ann. Rept. Philippine Bur. Agric., 1920, Manila,* 1921, pp. 47–51, 3 plates. [Received 2nd August 1921.]

Locust infestation in 1920 was confined during January and February to 5 districts only, but increased in May to 46, and in October to 52, after which it diminished. The extermination of this pest has been greatly helped by the Locust Law, which secures the co-operation of the towns and municipal and provincial officials. The regular locust breeding places are supposed to be in the area of bamboos and reeds in the province of Cotabato. Arrangements are being made for planting this area with such quick-growing trees as *Leucaena glauca*.

Most of the coconut palms attacked by black and red beetles [*Oryctes rhinoceros* and *Rhynchophorus ferrugineus*] survive, except where they are few in number and where sugar-cane is grown, as the putrefying sugar bagasse is a favourable breeding place for these beetles. Outbreaks of the leaf miner, *Promecotheca cumingi*, were controlled by parasites. *Thosea cinereomarginata* severely attacked certain coconut groves, but the caterpillars were easily controlled by three species of Hymenopterous parasites, while a Dipteron attacked the pupae.

Many insects were intercepted by the Plant Inspection Service during 1920, including *Bruchus* sp. in cowpea seeds from California, and *Rhabdocnemis obscura* in sugar-cane cuttings from Hawaii.

An Administrative Order was made prohibiting the importation of fruit from countries where the Mediterranean fruit-fly (*Ceratitis capitata*, Wied.) is established. In the case of Australia, fruit may be imported, subject to the ordinary inspection, from the States of Victoria, Tasmania and South Australia, if accompanied by a certificate that it originated from such States and is free from any pests or diseases.

Garman (H.). **The Relation of the Kentucky Species of** *Solidago* **to the Period of Activity of Adult** *Cyllene robiniae*.—*Kentucky Agric. Expt. Sta., Lexington,* Bull. 231, March 1921, 22 pp., 6 figs. [Received 3rd August 1921.]

This paper consists mainly of continued observations on the adult of the Cerambycid beetle, *Cyllene robiniae*, and its food-plant, *Solidago*, together with other related species [*R.A.E.*, A, v, 401].

The life of the adult borer extends from September to October, the beetles disappearing when the frosts destroy the goldenrod flowers. A list is given of the species of *Solidago* in Kentucky on which *C. robiniae*

has not been seen. It has been observed on *S. rugosa*, *S. nemoralis*, *S. canadensis*, and *S. altissima*, and also on *Eupatorium serotinum* and *E. perfoliatum*.

On the bodies of dead beetles a fungus, *Sporotrichum globuliferum*, has been found, but observations indicate that it cannot destroy healthy beetles.

Some adult borers were collected in April from the trunks of locust trees left lying on the ground. The males tend to resemble the hickory borer, *C. picta*, though the females are more like *C. robiniae*. The following alternatives may possibly explain the relations of the spring form of these beetles with those so common on goldenrod and locust trees in the autumn: (1) there are two distinct species, one living on hickory and walnut, appearing as adults in the spring, and the other living on locust and appearing as adults in the autumn; (2) there are two forms of one species, one appearing as adults in spring on locust, hickory and walnut, the other appearing as adults in the autumn on locust only; (3) there are two generations of the same species, one maturing in spring, the other in the autumn, the latter in no way differing from the former. The author is inclined to favour the second of these hypotheses.

UICHANCO (L. B.). **Musculature and Mechanism of Movement of the Tarsi in Aphids.**—*Psyche, Boston, Mass.*, xxviii, no. 3, June 1921, pp. 63–69, 1 plate.

The contents of this paper are indicated by its title.

MUIR (F.). *Cyrtorhinus* **in Hawaii and some Factors acting against it.** —*Hawaiian Planters' Record, Honolulu*, xxiv, no. 6, June 1921, pp. 285–286.

The first colony of the Capsid bug, *Cyrtorhinus mundulus*, liberated in July 1920, disappeared after producing one generation. Subsequent colonies in Hawaii have maintained themselves for several generations, but have not spread to any extent.

Experiments have proved that neither climatic conditions, nor the egg-parasite (*Paranagrus optabilis*) of the leaf-hopper [*Perkinsiella saccharicida*] are harmful to *C. mundulus*, but investigations in cane fields for insects likely to attack it in any stage have attracted attention to *Zelus renardii*. This Reduviid bug is predaceous on leaf-hoppers, but it also attacks Coccinellids and other beneficial insects, and was probably responsible for the destruction of *Micromus vinaceus*, which was introduced from Australia against Aphids. It came originally from California, where there are five species of the genus. It is suggested that experiments should be made with any parasites of *Z. renardii* that may be found in California.

PEMBERTON (C. E.). **The Fig Wasp and its Relation to the Development of Fertile Seed in the Moreton Bay Fig.**—*Hawaiian Planters' Record, Honolulu*, xxiv, no. 6, June 1921, pp. 297–319, 8 plates.

This paper describes in detail the vital part played by the fig wasp in the production of fertile seed of the Australian fig, *Ficus macrophylla*, and emphasises the necessity of introducing this insect if this tree is to be permanently added to the Hawaiian forests.

Pleistodontes froggatti, Mayr, was the only fig wasp bred in Sydney from the Moreton Bay fig (*Ficus macrophylla*). *P. imperialis*, Saund., has been recorded, but is rare.

The presence of the fig wasp is necessary for the natural development of the Moreton Bay fig and for the development of the seeds, as the sequence of the development of the male and female flowers in the fig prevents self-pollination, and unless the female flowers are pollinated when the figs are young, the figs fall off, so that the male flowers do not come to maturity.

It has been proved that the nearer the temperature is to 50°–51°F., the longer the insect's life is prolonged; this may be useful knowledge for future shipments of different species of fig wasps. During the egg-laying the fig grows rapidly. The larvae remain in the gall flowers, feeding on the surrounding tissues, and there they pupate. The males emerge first; they outlive the females, but are less numerous. They immediately seek the females, fertilise them, then move to another flower. These females then emerge from the fig, seeking other young figs. The time required for the total development of the wasp entirely depends on the temperature and growth of the fig.

Several species of Hymenoptera other than *P. froggatti* were bred from fruits of the Moreton Bay fig, but none were true pollinators. Their larvae can serve only as parasites of the true fig wasp or of one another.

The work of other authors on the subject of fig wasps is briefly quoted.

The Moreton Bay fig is grown in regions where the wasp is not present, such as Melbourne and Auckland, but no fertile seed is ever formed.

There are many imported figs growing in Sydney, but none have their particular fig wasp introduced with them, with the exception of the Lord Howe Island fig, *Ficus columnaris*, which is botanically close to *F. macrophylla* and is fertilised by *P. froggatti*.

In January 1921, some Moreton Bay figs were shipped from Sydney to Honolulu, with living pupae of *Pleistodontes*. Half the shipment were kept in cases on the upper deck of the steamship, and all the wasps were dead when they reached Honolulu. The other half arrived alive, these having been kept in bags at a constant temperature of 45°F. Of these, 2,000 females were liberated in the two fig trees then in Honolulu, and they were observed entering young figs.

Various opinions as to the value and forest qualities of this fig tree are given.

FULLAWAY (D. T.). **The Fern Weevil** (*Syagrius fulvitarsis*, **Pasc.**).—*Hawaiian Forester and Agriculturist, Honolulu*, xviii, no. 5, May 1921, pp. 101–114, 1 plate, 5 tables.

The fern weevil (*Syagrius fulvitarsis*), which has hitherto been considered a greenhouse pest, appears to be threatening the forests of Hawaii [*R.A.E.*, A, viii, 191]. It has now spread over the entire country to the mountains. It is believed to have been introduced from Australia, where it feeds on the fleshy leaf-stalks of *Calipterus prolifera*. In Hawaii it attacks *Adiantum*, *Nephrolepis exaltata*, *Polypodium phymatodes*, *Asplenium* and other ferns, particularly *Sadleria cyantheoides*.

The female eats a cavity in the fern stem where she deposits eggs singly. The incubation period is about nine days. The larval stage occupies 1–4 months, and the pupal stage 9–10 days. The adults

are not sexually mature for some weeks and are long-lived. There are three generations a year on an average.

The injury is caused in the larval and adult stages, the larva working internally and the adult externally. Plants linger for a long period in a stunted condition after weevil attacks. The transportation of ornamental plants from one locality to another, and the fact that the weevil readily attaches itself to clothing, the hair of animals, etc., are the chief means of distribution, as the weevils cannot fly.

Remedial measures depend on the circumstances of infestation. Handpicking the adults and applying powdered or liquid lead arsenate to the plants are effective. Adults hiding in the soil can be brought into view by flooding, while prolonged soakings may kill the larvae and pupae. For serious infestations, the only effective remedy is a complete and thorough destruction of the ferns.

A Braconid larval parasite of the genus *Doryctes* has been introduced from New South Wales, and may prove of great benefit. Another Hymenopterous parasite, *Ischiogonus palliatus*, which has been known in Hawaii for many years as an enemy of Cerambycid and Curculionid beetles, has also been bred from *S. fulvitarsis*; and the weevils are destroyed to some extent by a fungus.

JEGEN (G.). **Zur Biologie und Anatomie einiger Enchytraeiden.** [On the Biology and Anatomy of some Enchytraeidae.]—*Vierteljahrschr. naturf. Ges., Zürich*, lxv, 1920, p. 100. (Abstract in *Wiener Landw. Ztg., Vienna*, 1921, no. 50–51.)

Enchytraeid worms have been found in strawberry plants feeding on the Nematodes, *Tylenchus devastatrix* and *Aphelenchus ormeroides*. If conditions favour them and the plant is sufficiently vigorous, they are capable of preventing its destruction by the Nematodes.

MORSTATT (H.). **Unsere Obstbaumschildläuse.** [Our Fruit-tree Coccids.]—*Mikrokosmos*, xiv, 1920–21, p. 11. (Abstract in *Wiener Landw. Ztg., Vienna*, 1921, no. 50–51.)

This is a review of the more important German species of DIASPINAE and LECANIINAE, with special reference to the hibernating stages of the latter.

BERNARD (C.). **Verslag van het Proefstation voor Thee over het Jaar 1917.** [Report of the Tea Experiment Station for 1917.]—*Meded. Proefst. Thee, Buitenzorg*, lviii, 1918, pp. 1–11. [Received 2nd August 1921.]

The information regarding mites and *Helopeltis* on tea contained in this report and in its supplements is included in papers already noticed [*R.A.E.*, A, vi, 37, 179; vii, 31, 41].

NALEPA (A.). **Neue und wenig bekannte Eriophyiden.** [New and little-known Eriophyidae.]—*Verhand. zool.-bot. Ges., Vienna*, lxx, no. 3–5, 30th November 1920, pp. 81–98. [Received 2nd August 1921.]

The subject-matter of this paper is indicated by its title; it includes descriptions of a new sub-species and six new species of plant-infesting mites.

Bongini (V.). **Un Nemico dei Piantamenti di Pioppo.** [A Pest of Poplar Plantations.]—*R. Osservatorio Fitopatologia, Turin,* Foglio d'Istruzione 1, 1920, 3 pp., 1 fig. [Received 2nd August 1921.]

Young poplar trees from three to five years of age are often attacked by *Saperda carcharias,* L., which bores into the stems near the ground and causes the plants to wither.

This Longicorn beetle oviposits in May and June on the rough bark near the ground, and the larvae mine the sub-cortical part, giving rise to hard swellings that interrupt the circulation of the sap. In autumn they work towards the heartwood, and in spring excavate vertical mines up to a height of about 5 ft. In the following spring they attain maturity and pupate, the adult emerging in May.

To protect unattacked trees in an infested plantation, the trunks may be smeared up to a height of 5–7 ft. with a mixture of lime and starch paste, or with a solution containing lime and 3 per cent. of tobacco extract. Other remedial measures include the collection of the adults and the destruction of the larvae by inserting a wad of cotton wool soaked in petrol and then sealing the hole with clay. If the larva is mature it may be picked out with a suitable tool.

Bongini (V.). **La Peste del Pomario, Afide lanigero o Pidocchio sanguigno del Melo** (*Schizoneura* [*Myzoxylus*] *lanigera*). [*Eriosoma lanigerum,* the Pest of Apple Orchards.]—*R. Osservatorio Fitopatologia, Turin,* Foglio d'Istruzione 2, 1920, 4 pp., 1 fig.

This leaflet on the woolly aphis, *Eriosoma lanigerum,* gives a brief account of its life-history and control. Remedial measures are obligatory in Italy in accordance with the decree of 28th September 1919.

Bongini (V.). **Il Perdilegno rosso** (*Cossus cossus,* **L.**). [The Red Borer, *C. cossus.*]—*R. Osservatorio Fitopatologia, Turin,* Foglio d'Istruzione 3, 1920, 3 pp., 1 fig. [Received 2nd August 1921.]

In Italy fruit-trees and all forest trees are liable to the attack of *Cossus cossus,* L. In June and July this moth oviposits on the bark. After hatching at the end of July the caterpillars remain together beneath the bark until autumn, when they bore separate mines towards the centre of the trunk and then travel upwards. They become mature in May of the third year and work towards the bark, pupating close to it in the mine, which is closed with silk and debris. Some trees may harbour 200 or more caterpillars.

Natural enemies are bats, beetles such as *Calosoma* spp., egg-destroying ants, and Hymenopterous parasites, including *Ichneumon pusillator, Meniscus setosus,* etc. Valuable trees may be protected by coating the base of the trunk, and all cuts or wounds, with a mixture of clay and ashes or with coal-tar.

While still gregarious the caterpillars may be crushed, the bark that has been opened for this purpose being closed up again and smeared with tar. If they are mining, a piece of wire may be used, unless they have reached the heartwood and are ascending, when petrol, paraffin, or carbon bisulphide must be injected or introduced on plugs of cotton wool. If the caterpillars are nearly mature the tree must be felled.

The moths may be captured in June or July, but they are difficult to detect on the bark.

Bongini (V.). **Il Bruco peloso degli Alberi da Frutto. Farfalla del Ventre bruno** (*Euproctis chrysorrhoea*, **L.**). [The hairy Fruit-tree Caterpillar of the Brown-tail Moth, *Nygmia phaeorrhoea*.]—*R. Osservatorio Fitopatologia, Turin*, Foglio d'Istruzione 4, 1920, 4 pp., 1 fig. [Received 2nd August 1921.]

Pears and apples are the fruit-trees that suffer most from *Nygmia phaeorrhoea* in northern Italy. In central Italy cherries and plums are chiefly attacked. The oak, chestnut and hazel are the forest trees most often infested. The usual preventive and remedial measures against this moth are mentioned.

Scagnolari (A.). **La Tignola, Ragna o Ruga del Melo** (*Hyponomeuta malinellus*, **Zell.**). [The Apple Moth, *H. malinellus*, Zell.]—*R. Osservatorio Fitopatologia, Turin*, Foglio d'Istruzione 7, 1920, 4 pp., 1 fig. [Received 2nd August 1921.]

In these notes on the life-history and control of *Hyponomeuta malinellus*, Z., *Ageniaspis fuscicollis*, Dalm., is mentioned as parasitising large numbers of this moth.

Scagnolari (A.). **Antonomo o Punteruolo del Melo** (*Anthonomus pomorum*, **L.**). [The Apple Borer, *A. pomorum*.]—*R. Osservatorio Fitopatologia, Turin*, Foglio d'Istruzione 9, 1920, 4 pp., 1 fig. [Received 2nd August 1921.]

The life-history and control of *Anthonomus pomorum*, L., are briefly described. Stress is laid on the necessity for supplementing winter treatment by spraying the flower-buds and later on by collecting those that become infested. Hymenopterous parasites, including *Pimpla graminellae*, *Encyrtus flavomaculatus*, *Bracon variator* and *Microgaster impurus*, are a very important factor in checking this weevil.

Ghirlanda (C.). **Il Bruco verde dei Cavoli** (*Pieris brassicae*, **L.**). [The Cabbage Butterfly, *P. brassicae*.]—*R. Osservatorio Fitopatologia, Turin*, Foglio d'Istruzione 11, 1921, 4 pp., 1 fig.

This leaflet deals with the bionomics and control of *Pieris brassicae*. In northern Italy there are two annual generations of this butterfly, and four in the south.

Bongini (V.). **Un Divoratore delle Foglie dei Pioppi** (*Melasoma* (*Lina*, *Chrysomela*) *populi*). [A Devourer of Poplar Leaves, *M. populi*.]—*R. Osservatorio Fitopatologia, Turin*, Foglio d'Istruzione 13, 1921, 4 pp., 1 fig.

A short account is given of the injury done to the leaves of poplars and willows by a Chrysomelid beetle, *Melasoma populi*, L., especially in spring. Heaps of dead leaves or other vegetable debris may be used as traps in winter, and any insects that have escaped the traps may be collected in spring. The foliage may also be sprayed with a 1 per cent. solution of lead arsenate or with a 2 per cent. solution of tobacco extract. A Tachinid fly, *Exorista dubia*, and a Chalcid, *Pteromalus sieboldi*, are among the natural enemies that check this pest.

DELLA BEFFA (G.). **La Limacina del Pero** (*Tenthredo limacina*). [The Pear Slug, *Eriocampoides limacina*.]—*R. Osservatorio Fitopatologia, Turin,* Foglio d'Istruzione 14, 1921, 3 pp., 1 fig.

Although *Eriocampoides* (*Tenthredo*) *limacina* is not a very dangerous orchard pest in Italy, it has done considerable damage in various regions there. Its life-history is briefly described. It is difficult to prevent an outbreak and preventive measures are likely to be unprofitable. It is best to watch the plants, and if serious loss is threatened dusting with quicklime, sulphur, or tobacco should be employed. A lead arsenate or nicotine spray may also be used. By digging up the ground from November to May and then rolling it, a large number of pupae are destroyed.

DELLA BEFFA (G.). **Il Sigaraio** (*Rhynchites betulae*). [The Leaf-roller, *R. betulae*.]—*R. Osservatorio Fitopatologia, Turin,* Foglio d'Istruzione 15, 1921, 3 pp., 1 fig.

Rhynchites betulae attacks a large number of plants, but prefers vine, poplar and pear. It is harmful only when very abundant. The best remedial measure consists in collecting and burning the curled-up leaves early in June, before they fall. Outbreaks would not occur if this were an annual practice. Collection of the weevils in the early morning or by jarring the trees may also be useful. Spraying with a 2 per cent. solution of nicotine is a preventive against an outbreak. Parasitic enemies, such as *Bracon*, *Microgaster* and *Pimpla*, are, unfortunately, difficult to encourage artificially, so that their undoubted value is largely discounted.

DELLA BEFFA (G.). **Il Cervo Volante e il Dorco** (*Lucanus cervus*—*Dorcus parallelepipedus*). [The Stag Beetle, *L. cervus*, and *D. parallelepipedus*.]—*R. Osservatorio Fitopatologia, Turin,* Foglio d'Istruzione 18, 3 pp., 1 fig.

The Lucanid beetles, *Lucanus cervus* and *Dorcus parallelepipedus*, have very similar habits. The former prefers old oaks, but also attacks willows and mulberries. The latter, which is more abundant, infests a larger range of plants, those already named and poplars being preferred. The larval and pupal stages are passed within the trunks. These beetles appear in larger numbers every four or six years, when collection should be especially practised, the trunks being smeared in places with honey. In the evening nets may be used. The larvae may be killed in their mines by a wire or by petrol fumes from a plug of cotton wool.

SILVESTRI (F.). **Contribuzioni alla Conoscenza biologica degli Imenotteri parassiti. V. Sviluppo del** *Platygaster dryomyiae*, **Silv. (Fam. Proctotrupidae).** [A Contribution to the biological Knowledge of parasitic Hymenoptera. V. The Development of a Proctotrupid, *P. dryomyiae*.]—*Boll. Lab. Zool. Gen. Agrar. R. Scuola Sup. Agric., Portici,* xi, 1916, pp. 299–326, 16 figs, 3 plates. [Received 3rd August 1921.]

The preamble of this paper is a brief account of the life-history of *Dryomyia lichtensteini*, F. Löw, the Cecidomyiid host of the Proctotrupid dealt with.

At Portici the adult Cecidomyiids emerge from galls on *Quercus ilex*, usually from 10th April to 20th May, and oviposit on the leaf-buds and growing leaves. The larva hatches after 5–6 days and punctures the parenchyma of the upper leaf-surface, forming a gall within which it pupates in the following year at the end of March or early in April. The adult emerges after a few days. The galls are typically single, though they may be close together where many occur on one leaf. As many as 157 larvae have been seen on an eight-inch leaf, though the number is usually less than 100.

The adults of *Platygaster dryomyiae*, Silv., appear at the same time as their hosts, but their maximum emergence occurs 1–4 days after that of the latter. They mate at once on emerging from the galls. The female deposits an egg in an egg or newly-hatched maggot of *D. lichtensteini*. Several females may oviposit in one host, but not more than two larvae develop. These pupate in March or April of the following year within the body of the host, the adults emerging soon afterwards. The stages of this parasite are described in detail.

Ghesquière (J.). **Machines pour le Traitement des Semences de Coton contre les Teignes.** [Machines for the Treatment of Cotton Seed against Moths.]—*Ann. Gembloux, Brussels*, xxvii, no. 7, July 1921, pp. 234–238.

The various machines used in the treatment of cotton seed against the pink bollworm [*Platyedra gossypiella*] in different countries, and particularly in Egypt, are reviewed [*R.A.E.*, A, vi, 42, etc.]. It is remarked that the latest information on the subject (October 1920) indicates Simon's hot air machine [*R.A.E.*, A, iv, 491] as being considered the best for the purpose by the British Cotton Growing Association.

Lambillion (L. J. L.). *Zophodia* **Hb.** *convolutella* **Hb. où en est son Histoire naturelle?** [What is the Life-history of *Zophodia convolutella*, Hb.?]—*Rev. Mens. Soc. Ent. Namuroise, Namur*, xxi, no. 7, July 1921, pp. 27–28.

The author has found in July of recent years that gooseberries, when ripe for gathering, were frequently entirely eaten out, leaving a debris of skin and seeds, mixed up with a mass of excrement and bound round with silk threads. Mature caterpillars have been obtained from infested berries and are being carefully reared for identification of the adults.

The moth, *Zophodia convolutella*, Hb., which feeds on gooseberries, was recorded in 1850 at Louvain from a single individual, and since that date seems to have remained unnoticed, or at least unrecorded.

Sicard (H.). **Action de la Bouillie Bordelaise au Pyrèthre et de la Bouillie Bordelaise nicotiné appliquées en Traitements curatifs contre la première Génération d'Eudémis.**—*Bull. Agric. Algérie-Tunisie-Maroc, Algiers*, xxvii, no. 6, June 1921, pp. 103–105.

With a view to dealing with the vine moth [*Polychrosis botrana*] and mildew with a single spray application, experiments were conducted to test whether the addition of copper salts would modify the action of pyrethrum, and whether the combination of pyrethrum-soap and Bordeaux mixture would compare in efficacy with the simple solution.

The mixtures used were 10 parts soap-pyrethrum to 90 parts of Bordeaux mixture, and 100 parts of Bordeaux mixture to one-fourth part nicotine extract titrated to 50 per cent. alkaloid. The next day 92 per cent. of the larvae were dead on the vines treated with pyrethrum, and 44 per cent. on those treated with nicotine. The action of nicotine, however, is slower and finally produced a total mortality of 60 per cent. after several days. These tests confirm the value of Bordeaux mixtures with pyrethrum-soap against the first generation of *P. botrana,* and their superiority over nicotine as a direct insecticide.

In reply to a remark concerning the difficulty of procuring pyrethrum, an editorial note states that the plant has been cultivated in the Botanical Station since 1894, and seems to be well adapted to the climate of the coast of Algeria ; it grows without any attention, and could be cultivated on all agricultural estates.

BARGE (J.). **L'Emploi du Jus de Nicotine contre les Insectes.**—*Rev. Agric. Afr. Nord, Algiers,* xix, no. 104, 29th July 1921, p. 585.

There are various brands of nicotine juice sold commercially which require dilution before they can be used as sprays. A 1 per cent. solution of nicotine must be diluted with five to ten times its volume in water ; for higher strengths of nicotine the volume of water is proportionately increased. It is well to add a solution of $\frac{2}{5}$ lb. commercial soda crystals and 2 lb. of soft black soap in 200 gals. of water to every 20 gals. of the weaker solution or 10 gals. of the stronger. For certain larvae, and the more resistant Aphids, about $1\frac{1}{2}$ pints of methylated spirit should also be added. For fumigation in greenhouses, nicotine extract [10 per cent. nicotine] should be diluted by five times only its volume in water, adding 2 lb. soda crystals per gallon of extract ; or 1, 2 or 4 lb. per 5 gals. of juice containing 1, 2 or 4 per cent. nicotine. The liquid is heated in a boiler and then sprinkled on bricks or iron sheets heated to a high temperature. The fumes should be allowed to act for several hours.

POUTIERS (R.). **Le Dépérissement des Agrumes causé par les Tétranyques.** [Withering of Citrus Trees caused by *Tetranychus.*]—*Progrès Agric. & Vitic., Montpellier,* lxxvi, no. 31, 31st July 1921, pp. 117–118.

The cultivation of *Citrus* in France is limited and localised owing to the climate ; the lemon in particular, with which this paper chiefly deals, is almost entirely confined to the region of Mentone, where the citrus industry is of great importance. The trees are greatly injured by the attacks of mites, particularly *Tetranychus telarius,* L., and, to a less degree, *T. latus,* C. & F., and *T. pilosus,* C. & F. The mites oviposit on the lower side of the leaves, near the veins, and weave a silken web under which they live and feed. After a short time the growth of the leaves ceases ; they turn yellow, dry up and fall, and the death of the branch follows if nothing is done to check the pest. Hot, dry weather is very favourable to the mites, and they appear at Mentone each year about June (or May in very dry seasons). The fruit also frequently harbours colonies of the mites, which produce on it brown scars due to a sort of chlorosis, caused by their gummy secretions. Fruit thus attacked falls from the tree before maturity.

As unusual dryness is one of the predisposing causes of this condition, one of the simplest remedial measures is to keep the plants well watered and work the soil around them so as to make it very permeable. Insecticide sprays, or even water, directed upwards, or sulphur powder applied with pressure, will kill the mites, but the plants should always be kept well watered also. Lime-sulphur solution in 5 per cent. strength has proved very successful in penetrating the webs. Some degree of control is maintained by natural enemies, but predators have the disadvantage of destroying simultaneously both the mites and any parasites living upon them. The Coccinellid, *Rhizobius litura*, F., which devours *Tetranychus* spp. in all stages, has been reared in small numbers in Mentone, as have *Pullus* sp. and *Scymnus* sp. Minute Staphylinids, probably of the genus *Hypocyptus*, seem to accompany the colonies of mites, probably living on their secretions.

Hitier (H.). **Un Parasite du Puceron lanigère.** [A Parasite of *Eriosoma lanigerum*.]—*Jl. Agric. Prat., Paris*, xxxvi, no. 30, 30th July 1921, p. 101.

Attention has been directed for some time towards the possibility of finding a parasite of *Eriosoma lanigerum*, which is so destructive to apple trees in France. The Chalcid, *Aphelinus mali*, has been introduced in small numbers from America, and has been very carefully propagated in special cages at various entomological stations. The results up to the present have been encouraging. Too much must not be expected, however, as the multiplication of the parasite in spring is slower than that of *E. lanigerum*; later in the season its activities may be of great benefit.

Wolda (G.). **Vogelkultuur en Vogelstudie.** [The Encouragement and Study of Birds.]—*Verslag. & Meded. Phytopath. Dienst, Wageningen*, no. 17, January 1921, 28 pp., 7 figs., 1 plate, 1 table. [Received 3rd August 1921.]

In 1920 an ornithological section was included in the Dutch Plant Protection Service. The encouragement of birds is very desirable, especially in view of the continued infestation by the nun moth [*Liparis monacha*] and the outbreaks of the pine moth, *Panolis flammea* (*piniperda*), in recent years [*R. A. E.*, A, viii, 225].

Bestrijding van Plantenziekten in kleine Tuinen. I. [Measures against Pests of Plants in small Gardens.]—*Verslag. & Meded. Plantenziektenk. Dienst, Wageningen*, no. 19, February 1921, 20 pp., 3 plates. [Received 3rd August 1921.]

Requests for information regarding remedies against the more important insect pests and fungous diseases of plants in small gardens in Holland has led to the issue of a simple manual of which this bulletin, dealing with winter measures, is the first part. It is essentially popular in character.

Wormstekigheid bij Appel en Peer. [Worminess in Apples and Pears.]—*Verslag. & Meded. Plantenziektenk. Dienst, Wageningen,* no. 20, April 1921, 18 pp., 2 plates. [Received 3rd August 1921.]

In Holland the fruit of apples and pears is infested by the moths, *Cydia* (*Carpocapsa*) *pomonella* and *Argyresthia conjugella*, the sawflies, *Hoplocampa testudinea* and *H. brevis*, and the pear gall-midge, *Contarinia pyrivora.* The life-history of these pests is briefly described.

Apples are attacked by *H. testudinea* in June and July, by *C. pomonella* from July to September, and about the end of the latter period by *A. conjugella.*

Pears are attacked by *C. pyrivora* in May, by *H. brevis* in June and July, and by *C. pomonella* from July to September.

Measures against *C. pomonella* include the use of band-traps, spraying with Paris green or lead arsenate, collecting infested fruits, shelter-traps in store-rooms, and the provision of nesting places for tits in orchards.

Against *H. testudinea* and *H. brevis* an arsenical spray and the collection of infested fruits are useful.

C. pyrivora can be destroyed at the cost of the entire pear crop by removing all the fruits or by destroying the blossoms with a suitable spray. Instead of this the immediate, careful collection of all fruits that are infested or thought to be so may be useful if scrupulously carried out.

No definite remedy exists for *A. conjugella.* The destruction of the caterpillars must be aimed at. Fallen fruit may be examined, young fruit sprayed with an arsenical solution before the eggs hatch, and the ground dug over so as to bury the pupae to a depth that prevents the emergence of the moths.

van Slogteren (E.). **Aaltjes-Ziekten in Bolgewassen.** [Nematode Diseases in Bulb Plants.]—*Plantenziektenk. Dienst, Wageningen,* Vlugschr. 26, March 1921, 8 pp. [Received 3rd August 1921.]

This circular reviews existing data on the infestation of bulbous plants by Nematodes—of which *Tylenchus dipsaci*, Kühn (*devastatrix*, Kühn) is the economically important species—and on the remedies available [*R. A. E.*, A, viii, 441].

Rondknop bij Zwarte-Bessenstruiken. [" Round Buds " on Black Currants.]—*Plantenziektenk. Dienst, Wageningen,* Vlugschr. 28, February 1921, 3 pp., 1 fig. [Received 3rd August 1921.]

Outbreaks of " big bud " on one-year-old twigs of black currant are due to infestation by mites [*Eriophyes ribis*]. These appear about March and infest all parts of the bush without doing any harm until June, when they collect on the young buds, into which they penetrate at the end of July, entering between the scales. They remain in this position until the following year. Eggs are first seen in August and are found up to the following July. This contemporaneous occurrence of eggs and mites makes remedial measures difficult, as continuous treatment is too costly in practice and may harm the plants. Once established, the pest spreads by its own efforts and by wind-carriage. At present the best results are obtained by removing and burning all affected buds during the winter. It is advisable also to remove the apparently healthy buds above and below an infested one. If this practice is carried out regularly, the infestation will gradually decrease.

Bloedluis (*Schizoneura lanigera*). [The Woolly Apple Aphis, *Eriosoma lanigerum*.]—*Plantenziektenk. Dienst, Wageningen,* Vlugschr. 29, February 1921, 4 pp., 1 fig. [Received 3rd August 1921.]

This circular briefly describes the life-history and control of *Eriosoma lanigerum.*

De slakvormige Bastaardrups der Ooftboomen, de Larve van de Bladwesp *Eriocampoides limacina,* **Retz.** (= *Selandria adumbrata,* **Klug**). [The Fruit-tree Slug, Larva of the Sawfly, *E. limacina.*]—*Plantenziektenk. Dienst, Wageningen,* Vlugschr. 30, March 1921, 2 pp., 1 fig. [Received 3rd August 1921.]

In Holland *Eriocampoides limacina,* Retz., chiefly injures pears, while cherries, apples, apricots, and sometimes also beeches, oaks and such ornamental plants as *Pyrus japonica,* are also attacked. A small number of larvae appear in June and July, and a considerable increase is often noticed in August and September, so that there may be two generations a year. The measures advised are collection or crushing, and dusting with insect powder or with finely powdered lime that has been recently slaked. A Paris green or lead arsenate spray may also be used.

Beukenwolluis (*Cryptococcus fagi,* **Dougl.**). [The Beech Scale, *C. fagi.*] *Plantenziektenk. Dienst, Wageningen,* Vlugschr. 31, March 1921, 2 pp., 1 fig. [Received 3rd August 1921.]

The life-history of *Cryptococcus fagi,* Dougl., is briefly described. Wind is chiefly responsible for the spread of this Coccid, the injury done by which does not appear to be as important as was formerly supposed. A good remedy consists in scrubbing the bark with a 7½ per cent. solution of carbolineum ; this is better than spraying. It is advisable to repeat the treatment.

Cryptorrhynchus lapathi, **L., de Wilgen- en Elzensnuittor.** [*C. lapathi,* the Willow and Alder Weevil.]—*Plantenziektenk. Dienst, Wageningen,* Vlugschr. 33, March 1921, 3 pp., 1 fig. [Received 3rd August 1921.]

Much injury is done to willows and alders, and sometimes to poplars, by *Cryptorrhynchus lapathi,* L. One case of infestation in birch was observed. After hibernating, the weevils mate in May. Oviposition continues up to August, the eggs hatching in the following March. The larvae become mature by the end of July and the pupal stage, which lasts about 14 days, is passed in the mine. The adults emerge in August. The only reliable remedy against the larvae is to collect and burn all infested twigs, which in July are recognisable by the debris from the borings. The adults may be caught in May by shaking them into a tray smeared with tar. As alders are preferred to willows, a few may be planted among the latter so as to attract the weevils.

Wilgenhaantjes. [Willow Beetles.]—*Plantenziektenk. Dienst, Wageningen,* Vlugschr. 34, March 1921, 3 pp., 1 fig. [Received 3rd August 1921.]

The Chrysomelids, *Phyllodecta vulgatissima,* L., and *P. vitellinae,* L., are sometimes abundant on willows. Of other species *Galeruca capreae* is the most important. The hibernated beetles mate in

spring and the eggs are laid in rows of 12-30 on the lower side of the leaves, the lower ones being preferred. The larvae appear in May and do more damage than the adults. Pupation takes place in the ground, and the resulting adults give rise to a second generation, the adults of which appear before the autumn and hibernate in cracks in the bark, hollow trunks, or other suitable refuges. The best method of dealing with these beetles is by spraying with lead arsenate or Paris green; the lower side of the leaves must be well covered to destroy the larvae. Willows with a hairy coating on the lower side of the leaves are not well adapted for spraying, but as feeding by the adults is not confined to the lower side, early spraying in the spring, when they first appear, is of great value. Tarred boards may be laid beneath the plants for capturing the beetles that are shaken off. *Salix viminalis* and its varieties are the willows that suffer most from *P. vulgatissima,* while *P. vitellinae* prefers the bitter *S. purpurea,* though it also often occurs on *S. viminalis.*

Het Spint (Roode Spin). [Mite Injury (Red Spider).]—*Plantenziektenk. Dienst, Wageningen,* Vlugschr. 36, April 1921, 3 pp. [Received 3rd August 1921.]

This circular on injury due to the mites *Tetranychus* and *Bryobia,* and on remedial measures for them, contains substantially the same information as a paper previously noticed [*R. A.E.*, A, vii, 431].

Pokziekte van het Pereblad. [Pear Leaf Blister.]—*Plantenziektenk. Dienst, Wageningen,* Vlugschr. 38, May 1921, 2 pp., 1 fig. [Received 3rd August 1921.]

In early spring the blisters due to *Eriophyes pyri,* Nal. (pear leaf blister mite) contain the mature female, which deposits 5–6 eggs and then probably dies; none were found in May. The young mites leave the old blisters and produce new ones on the same or other leaves. They usually hibernate beneath the second and third rows of bud-scales and may be reached by a 7½ per cent. carbolineum spray, applied before the leaf-buds begin to open. For lime-sulphur the date of spraying may be delayed somewhat, provided it is applied before the buds have opened to any extent.

In summer remedial measures have less chance of success. The infested leaves may be plucked before the mites enter their winter quarters. At the time they are migrating from the old blisters recourse may be had to spraying with sulphur-soap or with a 4 per cent. solution of liver of sulphur, or to dusting with flowers of sulphur.

Bogdanov-Katkov (N. N.).—**Практическая Энтомология. Руководство к практическим Занятиям по Энтомологии (Курс высших учебных Заведений).** [Practical Entomology. Handbook of Practical Studies in Entomology (Course for advanced educational Institutions).] — **Государственное Издательство** [Government Publication], Petersburg, pt. 1, 1921, 139 pp., 140 figs.

The present volume comprises the first ten lectures delivered at the course of rural economy at the Kamenoostrov institute of agronomy and forestry. It deals with the general structure of insects and their

division into orders, including descriptions of the chief types of larvae and pupae. The orders themselves will be dealt with in detail in subsequent parts, one of which is to be devoted to the description of summer measures against insect pests.

JEPSON (F. P.) & KNOWLES (C. H.). **Division of Entomology.**—*Ann. Rept. Fiji Dept. Agric. 1919, Suva,* Council Paper no. 65, 1920, pp. 7–14. [Received 3rd August 1921.]

Bananas in Fiji are severely damaged by the banana borer, *Cosmopolites sordidus.* One of the most effective remedies against this weevil is a system of crop rotation. Land that is planted each year for 20 or 30 years with nothing but bananas has no opportunity of being freed from the weevils infesting it. Growers in Fiji are very careless about planting infested suckers, and others neglect to dig out the grubs from suckers, believing that the wounds render them liable to attack by adult weevils. The value of traps is discussed, and the importance of paying the necessary attention to them to prevent their becoming mere breeding places is emphasised. It is suggested that great advantage would be gained by acquiring a banana plantation and conducting it at the Government's expense, so that, while working it on a commercial scale, investigations and experiments could be carried out. The manuring of alternate rows of bananas would indicate the attraction, if any, that less vigorous plants have for the weevils, and might suggest the planting of weaker plants at intervals as baits. Numbers of the predatory Histerid, *Plaesius javanus,* have been imported from Java and were liberated in January.

The larva of a Pyralid causes the appearance of brown discoloured patches on bananas, which reduce their market value. The damage is always done in the early stages of development of the fruit and can be remedied by dusting with pyrethrum, before the spathe has properly opened, by means of a syringe with a rubber blower. Several species of *Aspidiotus* are prevalent, and though the damage due to scales is less than was formerly the case, it cannot be ignored. Very little spraying is done at present, but in the case of any increase in the number of scales it should at once be resorted to, and the damage should at least be limited to the leaves. A species of *Diaspis* has been found recently on bananas.

Lemons and all citrus trees in Fiji are attacked by the Coccid, *Chionaspis citri.* Lime-sulphur sprays should be used as a remedy.

Granadillas, which are grown in many gardens for domestic use, are frequently damaged when ripe by fruit-piercing moths, the resulting punctures encouraging the attacks of other insects, such as *Drosophila* and Nitidulids. It is suggested that the ripening fruits should be enclosed in muslin bags. *Hibiscus esculentus* is extensively grown by the natives, who use the leaves for food. Damage by *Diaspis pentagona* is severe, many stems being destroyed by this scale.

Aspidiotus destructor has become such a severe pest of coconuts in the islands around Ovalau and the island of Vitilevu that regulations have been made under the Diseases of Plants Ordinance requiring vessels leaving infested places to undergo inspection. An entomologist has been engaged to visit Tahiti for the purpose of studying and introducing into Fiji a parasite that has effectively checked the scale in that island.

Levuana iridescens (coconut leaf moth) has attacked coconut palms around Suva continuously throughout the year. The predator, *Canthecona cyanocantha* was observed on infested leaflets ; it is hoped

to investigate further the activities of this bug. On one estate, the palms were severely attacked by Phasmids, which killed one tree. *Promecotheca reichei* (coconut leaf-miner) was very destructive in some localities, though it is generally kept in check by a Hymenopterous parasite. It is thought that stormy weather produces a high mortality among these parasites and consequently is often followed by an increase of the pest.

Yams in storage are attacked by a borer that in its larval habits closely resembles *Cosmopolites sordidus* in bananas. Careful search should be made among stored yams, and damaged ones should be removed from the heap and fumigated with carbon bisulphide or hydrocyanic acid gas.

The beetle, *Sitodrepa* (*Anobium*) *panicea*, does a great deal of damage to books in Fiji, bindings being almost completely destroyed, and many official records would be rendered valueless if left untreated. Bookcases were fumigated twice with hydrocyanic acid gas, and enormous numbers of dead larvae and pupae were found. The egg-stage of this beetle averages twelve days and the pupal period about eight.

A species of *Diaspis* exercises a very effective control over the troublesome weed, *Stachytarpheta dichotoma*. The scale has not yet been identified, and may prove to be one already known to be destructive to economic plants.

A consignment of potatoes from Australia was destroyed owing to the presence of *Phthorimaea operculella* (*Lita solanella*).

GAGE (J. H.). **The Larvae of the Coccinellidae.**—*Illinois Biol. Monographs, Urbana*, vi, no. 4, October 1920, 62 pp., 6 plates. [Received 3rd August 1921.]

This paper records investigations on the morphology of Coccinellid larvae occurring in Illinois and includes tables for the identification of a few of the commoner species.

BALLOU (H. A.). **Pink Bollworm in the West Indies.**—*Agric. News, Barbados*, xx, no. 500, 25th June 1921, p. 202.

The pink bollworm [*Platyedra gossypiella*] has now become distributed throughout the Leeward and British Virgin Islands, but has not as yet been recorded from the islands of St. Eustatius, St. Martin or St. Bartholomew, nor south of Montserrat. In St. Kitts, Nevis and Montserrat cleaning-up processes [*R. A. E.*, A, ix, 99] have been carried out with with great thoroughness, and it is hoped that a reasonable degree of control has been obtained. While the importance of early planting is recognised, the weather conditions are frequently so uncertain as seriously to hamper the proper execution of remedial measures. Efforts are being made to eradicate all wild cotton plants from the islands in which they occur, thus removing a source of danger from both pink bollworm and cotton-stainers [*Dysdercus* spp.]. Great advantage would be gained if all cotton seed were treated at the ginneries, as in Egypt, so that there would be no movement of infested seed.

FROGGATT (W. W.). **Some Useful Australian Birds.**—*Sydney*, N.S.W. Dept. Agric., 1921, 85 pp., 61 col. plates. Price 10*s*. 6*d*.

The material from which this book is largely compiled began to appear in 1896, in a series of papers by the late Mr. A. J. North. A second edition was prepared some 16 years later, but its publication

was delayed by the war. In the present volume the letterpress of the second edition has been rewritten by the author, who also contributes a chapter on bird protection. The history of bird protection in Australia and other countries is briefly reviewed. The Bird and Animals Protection Act of 1918 ensures complete or partial protection to all birds and animals not "black-listed," with a close season while breeding. All bird sanctuaries in the State are described.

The book is divided into sections dealing with birds of garden, orchard and field; birds of forests and bush; and birds of inland plains, swamps, open forests and scrubs.

SEVERIN (H. C.). **The Black-horned Tree-cricket.**—*S. Dakota State Ent., Brookings*, Circ. 19, November 1920, 4 pp., 1 fig. [Received 5th August 1921.]

The black-horned tree-cricket (*Oecanthus nigricornis*, Wlk.) is a serious pest of fruit crops in South Dakota. Raspberry, blackberry, currant and gooseberry bushes suffer the most damage, but twigs of apple and plum trees, as well as of poplars, elders, sunflowers, etc., are also attacked.

Eggs are usually laid in the pithy stems of plants. One individual may lay as many as 150 eggs, and a single stem may receive hundreds of eggs. One row of eggs is often sufficient to girdle a stem, which then dies. Sometimes the canes split open, exposing the eggs and killing the stem, or the canes may break at the injured spot.

The winter is passed in the egg-stage. In the following June the larvae feed on Aphids and other soft-bodied insects, and on the leaves and petals of flowers, etc. The adults emerge in late summer. The larvae and adults are especially active at night, when feeding takes place. There is only one generation a year.

The remedial measures recommended are the cutting out and burning of all infested canes either after the first heavy frost or in early spring. All weeds likely to contain eggs should be destroyed.

SEVERIN (H. C.). **House Ants.**—*S. Dakota State Ent., Brookings*, Circ. 20, November 1920, 9 pp., 1 fig. [Received 5th August 1921.]

The species of ants that invade dwellings or stores in South Dakota are *Solenopsis molesta*, Say, *Monomorium minimum*, Buck., *M. pharaonis*, L., and *Lasius niger*, L., var. *americanus*, Emery.

S. molesta occasionally nests in buildings, and it swarms in immense numbers over food in houses and stores. *M. minimum* and *L. niger* nest out of doors, but enter dwellings in search of food. *M. pharaonis* nests in heated buildings, and is more of a pest than *S. molesta*.

Many remedial measures have been recommended, but the author considers poisoned baits and the carbon bisulphide treatment [*R.A.E.*, A, vi, 13] the most effective. Nickels' bait, which consists of 20 lb. sugar dissolved in 10 U.S. pints water, thoroughly mixed with 1 oz. sodium arsenite dissolved in a little water, was found attractive to ants at first, but in the course of time became repellent, and consequently Barber's bait [*R.A.E.*, A, viii, 285] was perfected.

A repellent bait consists of 3 grammes sodium arsenite thoroughly stirred into $\frac{1}{3}$ pint of karo syrup. This does not, however, kill the

ants. If ants nesting indoors are not attracted by any of these baits, 3 grammes sodium arsenite thoroughly mixed in a cupful of warm lard or similar grease may be effective.

An excellent barrier for ants is ½-inch cotton tape treated with a saturated solution of corrosive sublimate in water. Only porcelain, glass or granite-lined vessels should be used for its preparation, as it corrodes metals, and the solution should be filtered before the tape is soaked in it. This will form a protection for shelves, tables, and even rooms, and usually remains effective for a year.

SEVERIN (H. C.). **Clothes Moths.**—*S. Dakota State Ent., Brookings,* Circ. 21, November 1920, 10 pp., 2 figs. [Received 5th August 1921.]

Three species of clothes moths occur in the United States: *Tineola* (*Tinea*) *bisselliella,* Humm., *Tinea pellionella,* L., and *Trichophaga tapetzella,* L. The first two have been found in South Dakota.

The life-history of *T. bisselliella* is described [*R.A.E.,* A, vi, 48, 433].

Some of the remedial measures recommended have already been noticed [*R.A.E.,* A, vi, 532]. Fumigation with 2 lb. sulphur per 1,000 cubic feet in buildings, with a temperature not less than 70° F. for 12 hours, is effective, but is liable to bleach materials and tarnish metals. Clothes liable to attack should be shaken, brushed and exposed to sunlight. Uninfested materials should be stored in boxes with one teaspoonful carbon bisulphide for each cubic foot of space. Gasoline or benzine can be used on upholstered furniture. A temperature of 140° F. kills the moth at all stages in an hour, and larvae kept in a temperature of 18° F. for some time, suddenly transferred to 50° F. for a day, and then returned to a lower temperature, were killed. The larvae remain dormant at temperatures below 40° F.

SEVERIN (H. C.). **The Large Willow Sawfly.**—*S. Dakota State Ent., Brookings,* Circ. 22, November 1920, 4 pp., 1 fig. [Received 5th August 1921.]

The large willow sawfly (*Cimbex americana,* Leach) is one of the most serious willow pests in South Dakota. It is reported from other States as also feeding on elm, linden, maple and poplar. The larvae cause the most injury by defoliation, and the adults cause slight damage by girdling the stems.

Eggs are deposited in the tissues on the lower surface of the leaf. As many as 500 eggs may be laid by one individual. The larvae hatch in eight days and feed upon the leaves. In the latter part of August they form cocoons among dead leaves or in the soil under the trees, and pupate in spring. The pupal stage lasts two weeks, and the adults emerge early in June.

This sawfly has a considerable number of parasitic and predaceous enemies, but they are not sufficient to control it. The most satisfactory sprays, for use when the larvae appear, are 1 lb. lead arsenate paste or ½ lb. powder to 25 U.S. gals. water; ¼ lb. Paris green and ¼ lb. freshly slaked lime to 25 U.S. gals. water; or ½ lb. calcium arsenate and ½ lb. freshly slaked lime to 25 U.S. gals. water. When there are only a few trees, cocoons found underneath the trees should be raked up and burned in the late autumn or early spring.

SEVERIN (H. C.). **The Tent-caterpillar and the Fall Webworm.**—*S. Dakota State Ent., Brookings,* Circ. 23, November 1920, 10 pp., 4 figs. [Received 5th August 1921.]

The tent-caterpillar (*Malacosoma americana,* F.) and fall webworm (*Hyphantria cunea,* Drury) are serious pests of fruit and shade trees in South Dakota.

There is a considerable number of natural enemies of *M. americana,* though they are not always sufficient to control this moth. The following sprays are recommended when the nests appear, early in May: 1 lb. lead arsenate paste or ½ lb. powder to 40 U.S. gals. water; or 1 lb. Paris green and 1 or 2 lb. freshly slaked lime to 150 U.S. gals. water. The latter spray should not be applied to plum foliage. When the nests appear on the trees, the caterpillars may be destroyed by burning, or pruning out the webs and dipping them in pure kerosene. Egg-clusters should be collected when the trees are dormant. Worthless trees in which the pest breeds should be destroyed.

H. cunea is more abundant than *M. americana,* and in South Dakota attacks all deciduous trees and shrubs. Natural enemies cannot be relied on for complete control, and the measures recommended for *M. americana* can also be used against it. The egg-masses, however, are usually impossible to discover.

SEVERIN (H. C.). **The Army Worm.**—*S. Dakota State Ent., Brookings,* Circ. 24, November 1920, 10 pp., 4 figs. [Received 5th August 1921.]

Cirphis unipuncta, Haw. (army worm) does a certain amount of damage in South Dakota each year, but it is only in occasional seasons that conditions are so favourable to this moth and its parasites so scarce that crops are very seriously attacked. There are two generations in a year, and it is during July and August that the greatest damage is done. From 2 to 2½ months are required for the life-cycle of the summer generation, and 9½ to 10 months for the overwintering one. A description of the various stages and their habits is given.

When natural enemies, such as the Tachinid parasite, *Winthemia quadripustulata,* F., and such predators as insects, birds, poultry, toads and skunks, and fungus diseases, are insufficient to control the caterpillars, the usual remedial measures should be employed [*R. A. E.*, A, viii, 129].

WOLCOTT (A. B.). **North American Predaceous Beetles of the Tribe Tillini in the United States National Museum.**—*Proc. U.S. Nat. Mus., Washington,* lix, no. 2370, 1921, pp. 269–290, 1 plate.

This catalogue of Clerids includes descriptions of nine new species and one new variety. Provisional tables are given of the North American species of *Cymatodera,* Gray.

SCHAEFFER (C.). **New Species of North American Clerid Beetles of the Genus** *Aulicus.*—*Proc. U.S. Nat. Mus., Washington,* lix, no. 2365, 1921, pp. 151–159. [Received 5th August 1921.]

A key is given to the North American species of the genus *Aulicus,* and four new species are described, of which *A. fissipes* has been taken on cotton.

REH (L.). **Können wir Insektenschäden voraussagen?** [Can we predict Injury by Insects?]—*Der. prakt. Ratgeber Obst- u. Gartenbau, Frankfort-on-Oder,* xxxvi, no. 1, 2nd January 1921, p. 2. [Received 5th August 1921.]

It is usually impossible to predict injury by insects. The proper procedure is to assume the probability of an outbreak and take such practical measures as would be required in that case. This is comparatively easy in the case of annual crops, the clearing of all debris and crop rotation being obvious measures. In the case of trees and bushes all dead wood must be removed in winter, together with the fruits and leaves still present. Loose bark must be removed, and in February the trees should be sprayed with carbolineum. Before the buds open, a 3 per cent. copper-lime spray is advised, with the addition of 80 grammes of Urania green per 100 litres of solution. A $\frac{1}{2}$ per cent. copper-lime spray (also with the addition of Urania green) is then applied when the petals fall. This may be repeated 3–4 weeks later if any pests appear. In alternate years, lime-sulphur should be used instead of the above. For winter treatment 20–40 parts of lime-sulphur per 100 of water may be used before the buds open; for trees in foliage the strength must be decreased to 2–4 parts per 100. Strawberries in leaf must not be sprayed.

REH (L.). **Blausäure zur Bekämpfung von Ungeziefer.** [Hydrocyanic Acid Gas against Insect Pests.]—*Naturw. Wochenschr., Jena,* xxxiii, no. 45, 10th November 1918, pp. 638–642. [Received 5th August 1921.]

This paper briefly describes the uses and method of application of hydrocyanic acid gas against insect pests.

REH (L.). **Die wichtigsten Schädlinge des Gemüsebaues und ihre Bekämpfung.** [The most important Pests of Vegetables and their Control.]—*Hamburg,* Verlag Edmund Buchner, 1917, 2nd edn., 52 pp., 16 figs., 2 plates. Price 1 Mark. [Received 5th August 1921.]

This popular handbook on pests of vegetables gives in the case of each species its popular and scientific name, the damage it does, notes on life-history and on preventive and remedial measures.

The Sale of Diseased Plants Order of 1921.—*Statutory Rules and Orders, 1921,* no. 930, *H.M. Stationery Office, London,* 31st May 1921, 3 pp.

This Order comes into operation on the 1st October 1921 and prohibits the sale in England and Wales of any plant attacked by one or more of the following insects:—*Eriophyes ribis,* Nal. (black currant mite), *Eriosoma lanigerum,* Hausm. (woolly aphis), Coccids, *Nygmia phaeorrhoea,* Don. (brown tail moth), *Stephanitis* (*Leptobyrsa*) *rhododendri,* Horv. (rhododendron Tingid); or by various fungus and other diseases.

The Destructive Insects and Pests Order of 1921.—*Statutory Rules and Orders, 1921,* no. 931, *H.M. Stationery Office, London,* 31st May 1921, 5 pp.

By an Order which is to come into force on 1st October 1921 the landing in England or Wales of all living plants with a persistent woody stem above ground, and parts of the same, except seeds, when for use in propagation—such as fruit-trees, stocks and stools, forest trees, ornamental shrubs and grafts, layers and cuttings thereof; all potatoes, tubers, bulbs, rhizomes, corms and hop stocks for planting; seeds of onions and of leeks for sowing, and gooseberries—from any country other than Scotland, Ireland and the Channel Islands, is prohibited unless each package is accompanied by a certificate from the exporting country or authorised by a licence from the Ministry of Agriculture. This Article shall not apply to consignments to the Minister for experimental or scientific purposes.

This Order also authorises the inspection of premises, and the occupier may be required to adopt certain remedial measures within a prescribed time should any of the following pests be found :—*Phylloxera vastatrix,* Planch. (vine louse), *Heterocordylus malinus,* Reut., and *Lygidea mendax,* Reut. (American apple Capsids), *Stephanitis pyri,* F. (pear Tingid), *Leptinotarsa decemlineata,* Say (Colorado beetle), *Conotrachelus nenuphar,* Hbst. (plum curculio), *Phthorimaea operculella,* Z. (potato moth), *Malacosoma americana,* F., and *M. disstria,* Hb. (American lackey moths), *Cydia molesta,* Busck (oriental fruit moth), *Aspidiotus perniciosus,* Comst. (San José scale), *Diaspis pentagona,* Targ. (Japanese fruit scale), *Rhagoletis pomonella,* Walsh (apple fruit-fly), *R. cerasi,* L., *R. cingulata,* Lw., and *R. fausta,* O.-S. (cherry fruit-flies), *Epochra canadensis,* Lw. (gooseberry fruit-fly), and various fungi.

Goude (H.). **Eradicating Gall Mite (Big Bud) from Black Currant Stocks.**—*Jl. Minist. Agric., London,* xxviii, no. 5, August 1921, pp. 460–462, 2 figs.

The propagation and distribution of "big bud" occurs every year in all districts where black currants are cultivated, and the question of raising clean stock is a serious one. The fact that bushes obtained for planting are free from big bud is of little practical value, unless they are also free from the mite [*Eriophyes ribis*] that causes that condition. No stocks examined by the author during the past 17 years have been entirely free from the mite, big bud developing as soon as they were subjected to the strain of faulty cultivation, adverse weather or fruit-bearing. The plantation then becomes unprofitable, and is usually uprooted. Clean bushes, even though planted close to infected ones, generally remain free from the disease for six or seven years, but as soon as mite or reversion occurs the plants are uprooted, so that what should be the heaviest fruiting years—the 5th, 6th and 7th—are lost. The condition known as reversion is prevalent in most plantations, and many growers associate it with the presence of the mite, but the fact that it has been observed in seedlings proves that the mite is not the sole cause. It is probable that any serious check to the growth of the plant, or a combination of adverse circumstances, will start reversion.

In order to raise clean bushes, a start should be made in April or May, which is the only period of the year when there are no mites in the

buds, the embryo buds being undeveloped and offering no shelter for them. Soft cuttings taken in April and May should be soaked for one hour in an insecticide bath, composed of $\frac{1}{2}$ oz. nicotine (98 per cent.), 4 oz. soft soap and 5 gals. of water, to kill any external mites. They should then be rinsed in cold water and set out 6 in. apart in a cold frame, which should be closed and shaded from the sun. In about a month the cuttings should have rooted and will gradually harden, and the frame should then be lifted off to ripen the wood fully. This method of propagation from soft cuttings offers possibilities of raising clean stock in plants subject to perennial diseases. Red and white currant bushes are not infrequently infested with *E. ribis*, and this fact should not be disregarded, as it is a possible source of reinfestation to clean stock of black currants.

WARBURTON (C.). **Annual Report for 1920 of the Zoologist.**—*Jl. R. Agric. Soc. England, London,* lxxxi, 1920, pp. 247–253. [Received 13th August 1921.]

General pests during the spring and early summer of 1920 included the turnip-fly [*Phyllotreta nemorum*], red spiders [*Tetranychus*] and various caterpillars; these, however, disappeared with the coming of the July rains. Pests of cereals included the gout-fly [*Chlorops taeniopus*] in barley, and frit-fly [*Oscinella frit*] in oats. The latter now attacks winter wheat each year, the source of infestation being the preceding rye-grass, in which the larvae survive long after it has been ploughed in. For this reason, wheat after a bastard fallow is much less likely to suffer than wheat following rye-grass. Wheat bulb-fly [*Hylemyia coarctata*] occurred as usual on wheat, and was also observed for the first time on winter barley. Every bad attack of this fly seems to follow a fallow, and land heavily cropped the previous season often remains free. Observations on its life-history show that oviposition in captivity occurs in mid-July. A few larvae hatch in November, but it is thought that the normal time for hatching is probably in spring. The experiment up to the present tends to confirm the view that the flies select bare ground, and not plants, on which to oviposit. It is thought that the larvae originally fed upon decaying vegetable matter, and that their attack on wheat is a change of habit. Wheat-midge [*Contarinia tritici*] and thrips also caused some damage to wheat.

Peas were attacked by *Sitones* spp. in the early stages, and later by pea-thrips [*Kakothrips pisivora*], pea-midge [*Contarinia pisi*], and pea-moth, *Cydia nigricana* (*Grapholitha pisana*), the last-named being particularly harmful to late peas. Beans in some districts suffered from the bean-aphis [*Aphis rumicis*], and Bruchids injured beans in storage. Flea-beetles included *Phyllotreta nemorum* on turnips, *P. concinna* on mangels and *P. affinis* on potatoes. Pygmy beetles [*Atomaria linearis*] also damaged mangels. Root crops were damaged by wireworms, carrot-fly [*Psila rosae*] on carrots and parsnips, onion-fly [*Hylemyia antiqua*], celery-fly [*Acidia heraclei*] and asparagus beetle [*Crioceris asparagi*]. The most troublesome cabbage pest was *Barathra* (*Mamestra*) *brassicae* (cabbage-moth), which bores into the heart of the vegetable and is very resistant to insecticides.

On fruit, Aphids were the most important pest. Plums were injured by the caterpillars of *Cydia* (*Opadia*) *funebrana*. Loganberries failed owing to grubs of *Tipula* sp. at the roots.

Forest trees suffered chiefly from a species of *Chermes* found on Douglas fir in the New Forest and recognised as being identical with *C. cooleyi* var. *loweni* occurring in North America. In the United States the alternative food-plants are certain spruces, and in England the Sitka spruce (*Picea sitchensis*). The attack on the latter tree is almost entirely confined to the lower branches, and it has been remarked that if it were possible to remove or even spray the lower branches of spruce in June and July the pest might easily be controlled. Minor pests of forest trees include willow-scale [*Chionaspis salicis*], ash-bark beetle (*Hylesinus fraxini*), hazel gall-mite [*Eriophyes avellanae*], poplar longicorn [*Saperda*] and wood-wasps [*Sirex* spp.].

STRICKLAND (E. H.). **Parasites of the Pale Western Cutworm in Alberta.**—*Canad. Ent., Guelph*, liii, no. 5, May 1921, pp. 97–100. [Received 8th August 1921.]

Since 1911, *Porosagrotis orthogonia*, Morr., has been the most destructive pest of grain crops in Alberta and in parts of south-western Saskatchewan, the damage in some years amounting to over £200,000. No remedial measure has proved successful when applied to large infested areas. The winter is passed in the egg-stage, which is very resistant to frost, and the larvae remain underground, where they are protected from predators such as *Calosoma frigidum*, Klg., and *Ammophila* spp., and are unaffected by irrigation.

Parasites however are important, and the severity of outbreaks can usually be gauged in advance by a study of the parasite conditions of the previous year. Species that have been bred in considerable numbers are the Hymenopteron, *Meteorus dimidiatus*, Cress., which has two generations in a year, the larvae hibernating in overwintering cutworms such as *Euxoa tristicula*, Morr. The adults emerge in May and attack *P. orthogonia* and other Noctuids. The female lays about twelve eggs in each host, and adults of the second generation usually emerge in July. This Braconid has also been bred from *Sidemia devastatrix*, Brace, a cutworm that has never been recorded as coming to the surface.

Gonia capitata, DeG., and at least two allied species of Tachinid, have one generation a year, hibernate as pupae, and emerge as adults in May. The eggs are laid in numbers on vegetation, and hatch when eaten by cutworms. The larvae mature at about the time that the host pupates, and hibernate as pupae either in the soil or in the dead larva or pupa of the host. The selection of vegetation by the fly and the position of eggs on the selected plants are important factors that affect the value of this parasite. The most abundant oviposition has been found on blue-joint grass (*Agropyron smithi*), less frequently on other native grasses and imported Gramineae and grain crops. As *P. orthogonia* does not feed readily on blue-joint and *G. capitata* does not apparently prefer the lower portion of the plants for oviposition, the high percentage of parasitism is rather remarkable. Periods of drought are apparently beneficial to the parasite, necessitating more abundant oviposition on the fewer available plants. *Bonneta comta*, Wied., is a Tachinid parasite about which little is known. The adult appears in July and August and is larviparous. It has probably two generations a year, though it has not been bred from overwintering cutworms. Its habit in the selection of plants for oviposition is probably similar to that of *G. capitata*, *P. orthogonia*

showing 21 per cent. of parasitised individuals on spring wheat and none on lucerne. Less important parasites are a Hymenopteron, *Zele* sp., and the Tachinids, *Peleteria robusta*, Wied., and *Ernestia radicum*, F. It is thought that with more complete knowledge of the life-histories, particularly of the Tachinids, it may be possible to encourage their increase by the selection of favourable crops and a consideration of the most advantageous dates of sowing.

BUCKELL (E. R.). **Locust Control.**—*British Columbia Dept. Agric., Victoria*, Circ. 63 (New Hortic. Ser.), June 1921, 12 pp., 8 figs.

The species of locusts most injurious to range land, vegetable crops and fruit-trees in British Columbia are *Camnula pellucida, Melanoplus atlantis* and *Platybothrus brunneus* on range lands, and *M. femur-rubrum* and *M. bivittatus* in the more humid districts. The preparation of poison bait according to the Kansas formula is described, with a suitable canvas bag fitted with a metal spout for distributing it. A useful machine for catching grasshoppers, as well as the usual hopperdozers, is described and illustrated. Neither of these measures is practicable on the large areas of range land, which are very thinly populated and where overgrazing frequently occurs. Careful preservation of the ranges by fencing and a system of range rotation will restrict the breeding areas of some of the most injurious species. Fence-rows, roadsides or small areas of waste land on dry farms close to open ranges should be treated promptly, while the hoppers are young, or deeply ploughed before the eggs hatch. On lowland and valley farms locust invasions are comparatively rare, oviposition occurring occasionally on the drier pasture lands and on old clover and lucerne fields. These should be ploughed at least six inches deep after the eggs are laid in autumn or before they hatch in spring. The importance of co-operation in any anti-locust measures is emphasised.

FULLAWAY (D. T.). **Fig Insect Investigations.**—*Hawaiian Forester & Agric., Honolulu*, xviii, no. 6, June 1921, pp. 139–143.

An account is given of a journey to China and India with a view to ascertaining the most suitable species of *Ficus* to introduce into Hawaii for the purpose of reafforestation. The method of shipping *Ficus retusa* containing fig wasps is discussed.

During these investigations an attempt was also made to secure the fruit-fly parasite, *Syntomosphyrum indicum*, from India, but none were obtainable.

Zum Flug der Sauerwurmmotten. [On the Vine Moths of the Second Generation.]—*Luxemburger Weinztg., Grevenmacher*, ix, no. 16, 6th August 1921, pp. 191–192.

The second generation of the vine-moths [*Clysia ambiguella*, Hb., and *Polychrosis botrana*, Schiff.] appears to have been very unevenly distributed among the vineyards in Luxemburg in 1921. In one locality only two moths have been taken in spite of the fact that the first generation was numerous.

Les Syndicats de Défense contre les Sauterelles. [Syndicates for Defence against Locusts.]—*Rev. Agric. Afr. Nord, Algiers,* xix, no. 105, 5th August 1921, p. 604.

As a result of enquiry into the present organisation against locusts, it is found that 183 communities out of the 365 that comprise Algerian territory have formed syndicates for this purpose. This response to the appeal for the formation of syndicates is considered inadequate.

Louis-Dop (—). **L'Organisation Internationale de la Lutte contre les Sauterelles.**—*Conf. Internat. pour la Lutte contre les Sauterelles, 28–31 Octobre 1920, Inst. Internat. Agric., Rome,* 28 pp. [Received 11th August 1921.]

In this report of a meeting of the permanent committee of the International Agricultural Institute held 27th May 1916 the advisability of calling an international conference for the organisation of anti-locust measures is discussed. A resolution was passed [*R. A. E.*, A, v, 192] and the conference took place at Rome, 28–31 October 1920. The general plan for this conference is outlined and certain proposals are suggested on which the ultimate resolutions were based [*R. A. E.*, A, ix, 87].

Actes de la Conférence Internationale pour l'Organisation de la Lutte contre les Sauterelles. (Rome, 28–31 Octobre 1920.)—*Inst. Internat. Agric., Rome,* 1921, 142 pp. [Received 11th August 1921.]

In the course of these proceedings of the International Conference for the organisation of anti-locust measures, an agreement was drawn up that has already been noticed [*R. A. E.*, A, ix, 87]. This publication also includes a copy of the resolutions passed at the 1st Inter-colonial Conference for the control of locusts in South Africa in August 1916.

In accordance with the clause in the agreement, by which special arrangements are permissible between any of the States that wish to take combined action, a meeting was held, attended by the delegates representing Egypt, Tripoli, Tunisia, Algeria, Morocco and French West Africa, at which a definite plan of action was adopted. Each of the above-mentioned countries is to carry out scientific biological studies, the results of which are to be communicated to the crop protection service at Algiers. This service is to form a centre for the amalgamation and dissemination of such information. The appearance of winged locusts is to be reported immediately to the service, which will prepare flight charts to be forwarded to all the interested countries between the 1st and 14th of every month.

Pouleff (S.). **La Lutte contre les Sauterelles en Bulgarie.**—*Ibid.*, pp. 119–120.

The locusts recorded from Bulgaria are *Calliptamus italicus*, L., *Dociostaurus* (*Stauronotus*) *maroccanus*, Thunb., *Dociostaurus crucigerus*, Ramb. (*S. brevicollis*, Eversm.), *Celes variabilis*, Pall., *Oedipoda coerulescens*, L., *Podisma pedestris*, L., *Tettigonia verrucivora*, L., *Barbitistes ocskayi*, Charp., and *Decticus albifrons*, Cyr.

Oviposition occurs in September in fields that are generally dry and exposed to the sun, and the eggs hatch about May or June. Remedial measures in Bulgaria are usually organised by the agronomists and those holding state professorships in agriculture. The usual method adopted is the collection of adults. For this purpose persons armed with branches form concentric circles, which are gradually contracted until the locusts are collected in a suitable area for crushing. Eggs may be destroyed by spreading straw over the field and burning it. In the experiment described a layer of straw 12 to 20 in. thick was used.

GILLIN (—). **La Lutte contre les Sauterelles dans la Tunisie.**—*Ibid.*, pp. 121–122.

Tunisia is frequently invaded by the locust, *Schistocerca peregrina.* By the decree of 14th February 1916 the obligatory measures for the destruction of locusts in Tunisia are defined, the Agricultural Administration Service being responsible for the organisation of such measures. All owners or tenants of land are required to report any appearance of the locusts to the local authorities and to undertake without delay the remedial measures prescribed by them. The measures advocated are destruction of winged forms by crushing, burying, burning and collecting; the destruction of eggs by crushing the females during the oviposition period and the extraction of eggs from the soil by special instruments; and the destruction of the hoppers by the same means as applied against the winged forms and also by means of insecticides, etc. The usual insecticides are 3 to 5 lb. of soap to 10 gals. of water; 10 lb. of cresyl to 10 gals. of water; or 10 to 20 lb. of paraffin and 2 to 4 lb. of soap to 10 gals. of water.

By means of co-ordinated action the results obtained have been satisfactory, but it is suggested that the organisation would be improved by entrusting research work to the Zoological and Entomological Station at the Colonial School of Agriculture in Tunis and the protection service to the Technical Bureau of the Agricultural Administration.

VAYSSIÈRE (P.). **Procédés de Lutte utilisés en Crau contre le Criquet Marocain en 1920.**—*Ibid.*, pp. 123–126.

The measures here described against locusts [*Dociostaurus maroccanus*, Thunb.] in the Crau region in 1920 have already been noticed [*R.A.E.*, A, ix, 403].

DUFRÉNOY (J.). **Les Charançons des Myrtilles et des Arbousiers. Contribution à l'Etude du Peuplement des Ericacées.**—*Rev. Zool. Agric. & App., Bordeaux,* xx, no. 5, May 1921, pp. 38–39.

In consequence of the special biochemical characters of Ericaceae, the pests attacking them are few in number and are usually peculiar to them. The genus *Strophosomus* includes certain cosmopolitan species, some of which have been recorded on heaths, *e.g.*, *S. retusus* on *Erica* sp. Others have been found on very different Ericaceous plants; *S. retusus*, Marsh., together with *Eusomus* (*Polydrosus*) *ovulum*, devoured the leaves of *Vaccinium myrtillus* at Barèges (Hautes-Pyrénées), while neighbouring *Arbutus uva-ursi*, which has thick leaves, was apparently not attacked. *S. retusus* is found in numbers on the young terminal shoots of *A. unedo* and causes the formation of supplementary shoots.

As the Ericaceae are poisonous to most possible pests, those that infest them belong to only a few genera ; and these genera have been able to give rise to different species for each species of food-plant.

Garman (P.). **The Relation of certain Greenhouse Pests to the Transmission of a Geranium Leaf Spot.**—*Maryland Agric. Expt. Sta., College Park,* Bull. 239, October 1920, pp. 57-80, 7 figs. [Received 10th August 1921.]

The leaf-spot disease of geraniums dealt with is caused in part by the fungus *Cercospora brunkii.* The most important arthropods associated with the disease are the mites, *Tarsonemus pallidus* and red spider [*Tetranychus*], and a whitefly, but experiments prove them incapable of transmitting it. Infection is probably carried by watering. Suggestions are made for the control of the fungus.

Duckett (A. B.). **Annotated List of Halticini.**—*Maryland Agric. Expt. Sta., College Park,* Bull. 241, December 1920, pp. 111-155. [Received 10th August 1921.]

This paper is published posthumously, and for the purpose of condensation, the introduction and arrangement of the text have been considerably changed by E. N. Cory. The keys to the College Park genera and species of these flea-beetles are based on the works of Blatchley, Horn and Crotch. In all, 75 species are dealt with, of which a great many are of economic importance.

Dudley (J. E., Jr.), U.S. Bur. Ent., & Wilson (H. F.). **Combat Potato Leafhopper with Bordeaux.**—*Wisconsin Agric. Expt. Sta., Madison,* Bull. 334, July 1921, 31 pp., 17 figs.

The seasonal history of *Empoasca mali* (potato leaf-hopper) is described [*R. A.E.*, A, vi, 207], and the method of dealing with it by means of Bordeaux mixture is discussed [*R. A.E.*, A, ix, 31].

Lucerne Flea.—*Jl. Dept. Agric. South Australia, Adelaide,* xxiv, no. 11, June 1921, p. 893.

The most effective method of keeping the lucerne flea [*Smynthurus viridis*] in check is to allow sheep to graze very closely, after which the plot should be cultivated and harrowed. The effect of this method is increased if the land is wet while the sheep are on it, and if the flock is large enough to clear the plot quickly. The only effective insecticide is gas-lime, which requires very careful application to prevent injury to plants and even then is less efficacious than the rapid feeding of sheep followed by cultivation.

Bernard (C.). **Verslag van het Algemeen Proefstation voor Thee over het Jaar 1920.** [Report of the General Tea Experiment Station for 1920.]—*Meded. Proefst. voor Thee, Buitenzorg,* no. 74, 1921, 64 pp. [Received 10th August 1921.]

The tea pests reported included *Helopeltis, Pachypeltis,* the caterpillars of *Setora nitens* and *Thosea cervina, Zeuzera coffeae* (coffee-borer), leaf-rollers, *Andraca bipunctata* (bunch caterpillar), mites, *Poecilocoris hardwicki* (tea-seed bug), the tea-seed fly (*Adrama determinata*) and Nematodes.

Helopeltis was the chief object of study. The damage done by it increased on some estates and decreased on others. *S. nitens* and *T. cervina* were so threatening in some places that extensive pruning had to be expedited, the prunings being burned. In other infested localities collection of the cocoons and of the caterpillars gave good results.

P. hardwicki is believed to be responsible for loss of quality in the seed [*R.A.E.*, A, ix, 369], and this is being investigated. In some cases it was necessary to combat the tea-seed fly by burying or destroying the seed.

The increase in the number of requests for advice showed that planters are realising the value of expert assistance.

SIAHAIJA (E. L.). **Een Vergelijking van Keprisan en Schoonsnoei.** [A Comparison between Skiffing and Stick Pruning.]—*De Thee, Buitenzorg*, ii, no. 2, June 1921, pp. 45–48.

Among the points differentiating the effect on tea of skiffing (a form of top pruning) and stick pruning are those connected with infestation by *Helopeltis*.

Bushes that have been subjected to skiffing recover more quickly than if stick-pruned, probably because the new wood that is formed soon hardens. The new twigs also suffer less from the fungi that follow *Helopeltis* because their tissues are more woody. Where measures are not being taken against *Helopeltis*, the critical period of an infestation is therefore shorter with skiffing. But where *Helopeltis* is being collected, that measure is hindered by skiffing, as the bushes rapidly come in leaf.

The author concludes that for various reasons it is often necessary to alternate the two methods to obtain the best economic results.

MENZEL (R.). **Over het Optreden van een Parasiet in** *Helopeltis*. [The Occurrence of a Parasite in *Helopeltis*.]—*De Thee, Buitenzorg*, ii, no. 2, June 1921, pp. 55–56.

Some specimens of *Helopeltis* have been found to harbour a Nematode, and although there is no direct evidence that this parasitism proves fatal, it is probable that a parasite measuring 20 mm. in length by $\frac{1}{5}$ mm. in diameter must have some effect on the bug. The decrease of the pest in the district from which the affected *Helopeltis* were received may be due to this cause. Of 120 specimens examined, 67 per cent. were found parasitised.

Similar parasites have previously been noticed in Java and in British India.

GARRETSEN (A. J.). **Roetdauw.** [Sooty Fungus.]—*De Thee, Buitenzorg*, ii, no. 2, June 1921, pp. 56–57.

Investigation of cases of sooty fungus on tea showed that the fungus, *Hormiscium* sp., is a secondary pest, following infestation by a scale of the genus *Tachardia*.

MENZEL (R.). **Houtluizen onschadelijk voor Thee en Kina.** [Psocids are not injurious to Tea and Cinchona.]—*De Thee, Buitenzorg*, ii, no. 2, June 1921, pp. 57–58.

Psocids received from a cinchona estate in Sumatra prove to be *Psocus taprobanes*, Hag., a species recorded from British India, Malacca,

Java and Borneo. The presence of these insects on tea need cause no apprehension, as they feed on dead wood and bark, bark mosses, etc. The statement, published in 1915, that " *P. taprobanes* occasionally attacks tea in Assam and the Duars, congregating on the stems of the bushes and eating the bark," is probably an exaggeration.

ULTÉE (A. J.). **Verslag over het Jaar 1920.** [Report of the Besoeki Experiment Station for 1920.]—*Meded. Besoekisch Proefst., Djember,* no. 30, 1921, 25 pp.

Boxes of cigars severely infested with *Lasioderma* [*serricorne*] were sealed with paper in the customary manner and fumigated for one week with carbon bisulphide, 100 cc. per cu. m. After the eighth day all eggs, larvae, pupae and beetles were found to be dead ; and all traces of the carbon bisulphide had disappeared in three weeks. It is therefore possible to disinfect the boxes about one month before shipment.

Most of the pests received were the coffee-berry borer [*Stephanoderes hampei*, Ferr.]. Others included mites on leaves of *Hevea* and white and green scales, [*Opatrum sabulosum*] and ants on coffee. On one estate young coconut plants were severely injured by a beetle, *Brontispa* sp., and lead arsenate proving ineffective, experiments were made with a weak emulsion of kerosene-soap ; the result is not stated.

PRIESNER (H.). **Neue europäische Thysanopteren.** [New European Thysanoptera.]—*Wiener Ent. Ztg., Vienna,* xxxviii, no. 4–8, 15th June 1921, pp. 115–122.

The new species described are *Dendrothrips karnyi, Taeniothrips dianthi,* and *Euchaetothrips ingens.* Keys are given to some of the species of these genera.

PYNAERT (L.). **Les Bananiers.**—*Bull. Agric. Congo Belge, Brussels,* xii, no. 2, June 1921, pp. 239–293.

This paper, which forms one part of a series on the cultivation and uses of bananas, deals with the insect pests and diseases found in the various regions where the fruit is grown. The chief pest is *Cosmopolites* (*Sphenophorus*) *sordidus* (banana borer), the biology and control of which are briefly discussed. It is considered that the propagation of natural enemies of this weevil is the most important remedy. *C. sordidus* is of wide distribution in the tropics. In the West Indies, *Metamasius* (*S.*) *sericeus* is the commonest banana weevil; in Martinique, *C. sordidus* (*S. liratus*) ; in Papua and the Sandwich, Solomon and Society Islands, *Rhabdocnemis* (*S.*) *obscura* ; in Madagascar, *C. sordidus* (*S. musaecola*) ; and in Guinea and Madeira, *C. sordidus* (*S. striatus*). A Dynastid beetle, *Ligyrus ebenus* (*Tomarus bituberculatus*), has habits similar to *C. sordidus* and attacks bananas in the West Indies. Two species of whiteflies attack bananas, including *Aleurodicus cocois,* which is mainly a coconut pest in the West Indies and in tropical America. A fly, *Drosophila ampelophila,* causes decay of ripe fruit in hot weather. A moth, *Castnia licus,* generally a sugar-cane pest, bores into the trunks of bananas in South America and Trinidad. A fruit-fly, *Dacus ferrugineus,* F. (*tryoni,* Frog.), is a pest of bananas

in Queensland, and *D. curvipennis* has been recorded in bananas from Fiji. A Nematode, *Heterodera radicicola,* injures bananas in Trinidad, Fiji, New South Wales and Queensland. Bees and locusts also damage the fruits.

VANDERYST (H.). **Contributions à l'Etude du Palmier à Huile au Congo Belge.**—*Bull. Agric. Congo Belge, Brussels,* xii, no. 2, June 1921, pp. 305–352, 12 figs.

This paper is one of a series dealing with the oil palm (*Elaeis*) in the Belgian Congo. The commonest insect pests of this palm are *Oryctes monoceros,* Ol., *O. boas,* F., and *Rhynchophorus phoenicis,* F. The latter is particularly harmful, as it attacks the fruit-clusters, constructing galleries in the peduncle. The larval galleries of both genera of beetles have been found penetrating to the heart of the fruit-clusters. An undetermined Scarabaeid is also found, and a beetle, thought to be a species of *Xylotrupes,* occurs on the trunk, but it is not known to what degree it is injurious. A scale of the genus *Aspidiotus* is found on the leaves and fruit, but the trees do not apparently suffer much in consequence.

SMITS VAN BURGST (C. A. L.). **Parasieten van het Meelmotje** (*Ephestia kühniella,* **Zeller**). [Parasites of the Meal Moth, *E. kühniella.*]—*Tijdschr. Plantenziekten, Wageningen,* xxvii, no. 7, July 1921, pp. 77–79.

The best known natural enemy of the meal-moth, *Ephestia kühniella,* Z., is an Ichneumonid, *Nemeritis canescens,* Grv., but it is not quite so generally distributed as its host. It appears to be a monophagous parasite, only found indoors.

It is not generally known that the Braconid, *Habrobracon brevicornis,* Wesm., may be of much greater value than *N. canescens* in checking the meal-moth, as its reproductive power is much greater. Marshall mentions an instance where, on the termination of an outbreak of the meal-moth in an English flour store, myriads of the Braconid parasite were present. The female lives about 6 weeks and may deposit up to twelve eggs in one caterpillar. Under favourable conditions the entire development from egg to adult may be completed in twelve days, whereas *N. canescens* needs from 3 to 7 weeks. Both parasites seem to require warmth for rapid reproduction. In both, parthenogenetic reproduction may occur. In the case of *H. brevicornis* this method yields males only; whereas Dr. Paul Kruger has observed that the parthenogenetic eggs of *N. canescens* yield females only.

In Europe, *H. brevicornis* is known to the author from Belgium, England and Germany.

VAN SLOGTEREN (E.). **Hoe zijn Stellingen, Zolders of Zakken, die op eene of andere Manier door aaltjeszieke Narcissen zijn besmet, te ontsmetten?** [How is it possible to cleanse Places, Stores and Sacks contaminated by Narcissi infested with Nematodes?]—*Weekblad voor Bloembollencultuur,* xxxi, no. 77, 25th March 1921. (Abstract in *Tijdschr. Plantenziekten, Wageningen,* xxvii, no. 7, July 1921, pp. 84–86.)

Chances of infestation by Nematodes in bulbs are decreased by the most scrupulous cleanliness in all operations connected with cultivation.

In 99 per cent. of outbreaks the Nematodes have migrated from infested plants, or healthy plants have been placed in infested ground, or infested bulbs have been stored with healthy ones. The measures advised are those mentioned in a previous paper [*R.A.E.*, A, viii, 441].

MARKOVITCH (A.). **La Culture des Roses.**—*L'Echo de Bulgarie, Sofia,* 15th August 1921.

Roses in Bulgaria have recently been badly damaged by the Buprestid beetle, *Agrilus foveicollis,* Mars. The damage has probably been greater owing to the lack of cultivation in the rose-gardens during the war and the great scarcity of manures, resulting in a weak condition and loss of resistance in the plants. The beetles appear about mid-May and feed on the edges of the leaves. The eggs (to the number of about 30 per female) are laid singly under the bark of the current year's stem, preferably at its base. The egg hatches in 5 to 7 days, and the young larva wanders about under the bark for a few days, producing a small, black mine, and sometimes penetrating to the pith. During the second year, adventitious shoots begin to grow and at the same time the tips of the branches begin to wither, and in the third year the whole branch dries up. The larval stage probably lasts about a year, so that larvae are not found in branches that are already developed.

This beetle has previously been known in Siberia, but this is the first time that it has been recorded in Europe. The study of its life-history will greatly facilitate the campaign against this enemy of the important rose gardens of Bulgaria.

BURESCH (I.). **Бѣлѣжки изъ Фауната на Нощнитѣ Пеперуди на България.** [Notes on Nocturnal Lepidoptera of Bulgaria.]—**Трудове на Българското Природоизпитателно Дружество.** [*Mem. Bulgarian Naturalists Soc.*], *Sophia,* vi, 1914, pp. 39–98. [Received August 1921.]

The various developmental phases and habits of nocturnal Lepidoptera are described. The injurious species recorded are: on broad-leaved trees, *Porthetria* (*Lymantria*) *dispar,* L., *Nygmia phaeorrhoea,* Don. (*Euproctis chrysorrhoea,* L.), *Phalera bucephala,* L., *Aglia tau,* L., *Arctornis chrysorrhoea,* L. (*Porthesia similis,* Fuessl.), *Dasychira pudibunda,* L., *Cnethocampa* (*Thaumatopoea*) *processionea,* L., *Eriogaster lanestris,* L., *Saturnia spini,* Schiff., *S. pavonia,* L., *Stilpnotia salicis,* L. (chiefly on poplars), and *Phalera* spp., *Catocala elocata,* Esp., and *C. nupta,* L., (on willow and poplar).

Pests of fruit-trees are: *N. phaeorrhoea, P. dispar, Malacosoma neustria,* L., *A. chrysorrhoea, Gastropacha quercifolia,* L., *Notolophus* (*Orgyia*) *antiqua,* L., *Odonestis pruni,* L., *Diloba coeruleocephala,* L., *Catocala fulminea,* Scop., and *Saturnia pyri,* Schiff., the last chiefly on plums and cherries.

Cereal crops are injured by *Euxoa* (*Agrotis*) *tritici,* L., *E.* (*A.*) *segetum,* Schiff., *Feltia* (*A.*) *exclamationis,* L., *Phytometra* (*Plusia*) *gamma,* L., and occasionally by *Trachea* (*Hadena*) *secalis,* L. Pests of pastures are *P. gamma, P. gutta,* Gn., *Scotogramma* (*Mamestra*) *trifolii* Rott., *Euclidia mi,* Cl., *E. glyphica,* L., *Agrotis c-nigrum,* L., *A. ypsilon,*

Rott.. *A. ravida*, Schiff. (*obscura*, Brk.), *A. saucia*, Hb., *F. exclamationis*, *Phragmatobia fuliginosa*, L., and *Hypogymna morio*, L.

Barathra (*Mamestra*) *brassicae*, L., *Polia* (*M.*) *oleracea*, L., *Phytometra gamma*, L., and occasionally *Nygmia phaeorrhoea* are injurious to various vegetable crops.

Conifers are injured by *Liparis* (*Lymantria*) *monacha*, L., *Cnethocampa* (*Thaumatopoea*) *pityocampa*, Schiff., *Dendrolimus pini*, L., *Hyloicus pinastri*, L., *Bupalus piniarius*, L., *Ellopia prosapiaria*, L., *Semiothisa liturata*, Cl., *Boarmia crepuscularia*, Hb., *B. consortaria*, F., etc.

Buresch (I.). **Нощнитѣ Пеперуди на България съ Специаленъ Огледъ върху Врѣднитѣ Видове.** [The Nocturnal Lepidoptera of Bulgaria with special Reference to the harmful Species.]—**Трудове на Българското Природоизпитателно Дружество.** [*Mem. Bulgarian Naturalists Soc.*], *Sophia*, vii, 1914, pp. 9–100. [With German Summary.] [Received August 1921.]

This paper, which is supplementary to the preceding one, deals with all the nocturnal Lepidoptera so far recorded from Bulgaria, giving brief notes on the time of occurrence and life-history under local conditions. The species recorded include: the Notodontids, *Dicranura vinula*, L., on *Populus tremula*, which pupates about the second half of June, the adults emerging the following April or May; *Notodonta ziczac*, L., found chiefly in parks and plantations of poplars and willows, the first generation of adults appearing about April from hibernating pupae and the second about July; *Pterostoma palpina*, L., appearing in two generations on willow; and *Phalera bucephala*, L., occurring in May and August on birch, willow, lime, aspen and oak, especially on young trees in plantations. The chief remedial measure is cultivating the ground around the trees to expose the pupae. This should be done in March or April, and again in July and October and November. In May the adults may be shaken from the trees, and the larvae may be destroyed in a similar manner in June. This should be repeated again in August and September. *Pygaera anastomosis*, L., emerges from the hibernating pupae about March; a second generation of adults appears about May or June, and under favourable conditions a third about July or August. The larvae of this generation pupate about the end of August and hibernate. The Liparids recorded include *Notolophus* (*Orgyia*) *antiqua*, L., injurious to orchards and conifers, *Nygmia phaeorrhoea*, Don., and *Stilpnotia salicis*, L., on poplar and willow, the eggs of which do not overwinter but hatch in about 13 days, hibernation probably occurring in the larval stage and pupation taking place about June. No successful remedial measures are in operation against this moth, but it is greatly attracted to light. The almost universal gipsy moth, *Porthetria* (*Lymantria*) *dispar*, L., is also recorded from Bulgaria, where the winter is passed in the egg-stage, the larvae hatching about April. *Liparis* (*L.*) *monacha*, L., occurs chiefly on conifers, but has also been found on beech.

The Lasiocampid, *Malacosoma neustria*, L., is one of the chief pests of broad-leaved trees, although in some years it is practically absent. About 300 to 400 eggs are laid by each female. The winter is passed in the egg-stage, the larvae appearing about the beginning of April.

Pupation occurs about June and lasts from 12 to 14 days. *Eriogaster lanestris*, L., is widely distributed in Bulgaria, attacking *Crataegus* sp. and pear trees, but seldom other fruit-trees. The best time for destroying the caterpillars is in rainy weather, when they congregate in the nests. They are heavily parasitised by Ichneumonids. The seasonal history of *Lasiocampa quercus*, L., varies according to climatic conditions in different localities. In high altitudes it is replaced by *L. quercus* var. *callunae*, Palm.

Dendrolimus pini, L., has recently been found to occur in Bulgaria, where the eggs are laid early in July and hatch about the 20th. About the 6th September the larvae prepare for hibernation, and with the onset of warm weather in spring they again attack pines. The adults appear about May or June. The Endromidid, *Endromis versicolora*, L., occurs on pears. The Saturniid, *Perisomena caecigena*, Kup., feeds on oak and passes the winter in the egg-stage. *Saturnia pyri*, Schiff., occurs mostly on plum, pears and cherries, more seldom on apples. The adults emerge about the end of April or beginning of May. The eggs hatch in about 18 days, and pupation occurs about the middle of July. This moth is widely distributed in Bulgaria, but apparently does not occur in great abundance anywhere. The damage caused by *S. spini*, Schiff., is very local. The larvae occur during April and May on *Prunus spinosus*. The eggs hatch in from 14 to 20 days. Pupation occurs towards the end of May and may last through two or even three winters, the adults emerging about March. Many ornamental trees are attacked, especially *Prunus serotina*, and also certain willows such as *Salix rosmarinifolia*. The chief remedial measure is collection of larvae. The eggs of *S. pavonia*, L., hatch in from 10 to 16 days according to the prevailing temperature. The larvae feed on *Prunus spinosus*; they pupate about the latter half of June. They hibernate in the pupal stage, the adults emerging the following April; about 50 per cent. of the pupae remain in hibernation throughout another year. The Thyridid, *Thyris fenestrella*, Sc., is recorded from *Sambucus* sp. The Noctuid, *Acronycta megacephala*, F., pupates about September and the adults emerge the following May. It was taken on poplar. *A. psi*, L., occurs on various fruit trees. The larvae are found in June and August; hibernation occurs in the pupal stage of the second generation. *Simyra dentinosa*, Fr., occurs on various species of *Euphorbia*. *Agrotis c-nigrum*, L., is one of the common Noctuids in Bulgaria. *Euxoa* (*A.*) *tritici*, L., var. *aquilina*, Hb., is injurious to corn crops and pastures. *Barathra* (*Mamestra*) *brassicae*, L., has two generations, the adults occurring about May and July. Occasionally there is a third. Hibernation occurs in the pupal stage. The chief remedial measure consists in digging over the soil in the autumn so as to destroy the pupae mechanically and expose them to the attacks of birds and adverse weather conditions. *Diloba coeruleocephala*, L., has been found in orchards, but chiefly occurs on hawthorn. It causes slight damage to plums and cherries. Hibernation occurs in the egg-stage. The larvae are often parasitised by Ichneumonids. *Heliothis peltigera*, Schiff., occurs on *Salvia officinalis* and has two generations. The Syntomid, *Amata* (*Syntomis*) *phegea*, L., occurs on various grasses and is also injurious to pastures, as is also the Arctiid *Phragmatobia fuliginosa*, L. The latter moth probably has two generations and hibernates in the larval stage, though possibly it may sometimes pupate before the winter. The larvae of *Arctia caja*, L., occur chiefly on *Taraxacum* but will also feed on plum and nut trees, etc., and cause considerable damage to pastures.

Iltschew (D.). **Върху Биологиата на** *Daphnis nerii,* **L.** [On the Biology of *Deilephila nerii,* L.]—**Списание на Българската Академия на Науките.** [*Jl. Bulgarian Acad. Sci.*], *Sophia,* xvii, 1919, pp. 135–174, 3 figs., 2 plates. (With German Summary.) [Received August 1921.]

The life-cycle of *Deilephila* (*Daphnis*) *nerii,* L., in Bulgaria occupies about 57 days under artificial conditions. The eggs are laid chiefly on flower-buds and young leaves. They hatch in about eight days, and the larva feeds at first on the tender buds, but later it attacks the actual blossom and the leaves. All food-plants except *Nerium oleander* were refused under Bulgarian conditions. The larvae feed for about 41 days. In no case were they found to enter the soil for pupation; the cocoon is made on the soil surface from plant debris. The length of the pupal stage varied from 4–5 days in July to 8–13 days in November. Only the summer generation is complete in Bulgaria, as the pupae of the autumn generation are unable to withstand the winter conditions. The reappearance of this Sphingid in the spring is thought to be due to the migration of adults from more southern countries. The eggs that give rise to the migratory generation are probably deposited in December.

Gaudot (G.). **La Lutte contre le Bombyx Cul-brun.** [Remedial Measures against *Nygmia phaeorrhoea.*]—*Jl. Agric. Prat., Paris,* xxxvi, no. 32, 13th August 1921, pp. 136–137, 2 figs.

A general account of *Nygmia phaeorrhoea* (*Liparis chrysorrhoea*) in France is given, and the observations of various authors with reference to its occurrence and control are quoted.

Turinetti (L.). **L'Acclimatation des Insectes auxiliaires.**—*Rev. Hist. Nat. App., Paris,* Ière Partie, ii, no. 7, July 1921, pp. 216–221.

The propagation and establishment of *Cryptolaemus montrouzieri,* a Coccinellid predaceous on *Pseudococcus citri* and *P. adonidum* in the South of France, are described. Work on similar lines is being conducted by the "Service des Epiphyties" in connection with *Rhizobius lophantae,* predaceous on *Diaspis pentagona, Habrobracon johanseni,* a parasite of *Phthorimaea operculella,* and *Opius concolor,* a parasite of *Dacus oleae.*

Degrully (L.). **Producteurs directs et Phylloxera gallicole.**—*Progrès Agric. & Vitic., Montpellier,* lxxvi, no. 33, 14th August 1921, pp. 151–152.

As a result of enquiries with reference to the treatment of ungrafted vine stocks attacked by *Phylloxera,* Balbiani's formula for painting the pruned branches in winter after roughly scraping them is quoted, viz., 10 parts heavy tar oil, 30 parts crude naphthaline, 60 parts stone fat lime and 200 parts by weight of water. It is considered sufficient to apply the mixture every other year. There are other insecticides that would probably give similar results.

PICARD (F.). **Le Bombyx disparate ou spongieuse** (*Lymantria dispar*).—*Progrès Agric. & Vitic., Montpellier,* lxxvi, no. 33, 14th August 1921, pp. 160–165, 1 plate.

The life-history of *Porthetria* (*Lymantria*) *dispar* and the variations arising as a result of different food-plants are discussed. In France the irregularity of severe infestations is probably due to the activity of natural enemies such as the Carabid, *Calosoma sycophanta*; the Tachinids, *Compsilura concinnata, Tachina larvarum, Parasetigena segregata,* etc.; and the Hymenoptera, *Apanteles solitarius, A. tenebrosus, Ichneumon* spp., *Pimpla* spp., *Monodontomerus aereus, Anastatus bifasciatus* and *Eupelmus annulatus.* Their work may be supplemented by artificial remedial measures, such as destruction of the egg-masses in winter and of the larvae in spring.

Zur Sauerwurmbekämpfung. [Notes on combating the second generation of Vine Moths.]—*Schweiz. Zeitschr. Obst- u. Weinbau, Frauenfeld,* xxx, no. 16, 13th August 1921, pp. 245–247.

The Viticultural Institute at Freiburg, Baden, gave the following instructions for combating the second generation of the vine-moths [*Clysia ambiguella,* Hb., and *Polychrosis botrana,* Schiff.], which was expected to be numerous, as the first generation had caused much injury.

Nicotine is the best insecticide. A suitable spray is prepared by mixing 3 lb. of 10 per cent. nicotine extract in 18 gals. water, and adding a solution of 1 lb. of soft soap dissolved in 2 gals. warm water. The bunches require spraying from 20th to 30th July with enough fluid to drip from the bunches, a revolver sprayer being advised. Both eggs and caterpillars are soon killed.

Urania green may be substituted for the more expensive nicotine. It should be added to the lime-copper mixture, with a little soft soap to increase adhesiveness. To prepare 20 gals. of solution, 1½ lb. of copper sulphate is dissolved in 8 gals. water. Then 2 lb. of freshly burned lime (or 4–6 lb. of fat lime) is slaked and mixed to a thick paste, in which ⅖ lb. of Urania green is incorporated, sufficient water being then added to make up 8 gals. The two solutions are mixed, and the soap solution, prepared by dissolving 1½ lb. soft soap in 4 gals. warm water, is added after cooling. This spray must be thoroughly applied at the end of July. The caterpillars may in some cases succeed in pupating, but no further development is possible. Under present conditions in Germany the cost of this spray is about one-eighth that of nicotine.

METALNIKOW (S.) & GASCHEN (H.). **Immunité et Hypersensibilité chez la Chenille.**—*C. R. Hebdom. Acad. Sci., Paris,* clxxiii, no. 5, 1st August 1921, pp. 336–338.

The experiments here described show that larvae of *Galleria mellonella* become immunised against cholera infection within three hours after injection of the vaccine [*cf. R.A.E.*, A, ix, 441]. Although the treated larvae are immune to the minimum fatal dose, they appear to succumb more rapidly to larger doses than the untreated larvae. These observations support the hypothesis that the anaphylactic shock is the result of a too rapid cellular reaction stimulated by immunisation.

Circulars on Insect Control.—*Federal Reserve Bank, Kansas City.* 3rd January 1921, 1 p., and 15th July 1921, 2 pp.

The Federal Reserve Bank of Kansas City has undertaken the publication of a series of circulars on insect control issued in connection with the University of Missouri. This new step in publicity work has been taken with the object of uniting financial interests with the work of the colleges of agriculture in attempting to lessen the great losses in the chief grain crops in the Mississippi Valley.

Circular no. 12 (3rd January 1921) calls attention to the ravages of the chinch bug [*Blissus leucopterus*] in Missouri, and an appeal is made to all bankers to aid in an organised movement for burning the rubbish on farms that harbour the pests during the winter.

Another circular, dated 15th July 1921, gives estimates of the damage done in Missouri by the Hessian fly [*Mayetiola destructor*], and indicates the more essential remedial measures. The fly-free dates for sowing wheat in the various districts of the State are shown on a map.

Ballard (E.). *Helopeltis* **and its Relatives.**—*Planters' Chron., Coimbatore,* xvi, no. 30, 23rd July 1921, pp. 489–491.

It has now been established that *Helopeltis theivora* does exist in South India; and a few notes are given on this Capsid and its allies. The life-history of *H. theivora* does not differ from that of other Capsids. The eggs are laid in stems or broken ends of plucked twigs, and a single female may lay many hundreds. This bug is allied to *H. antonii*, which attacks nîm trees [*Melia azadirachta*], causing them to wilt. Before the results of Andrews' soil experiments [*R. A. E.*, A, viii, 204] can be tested in South India, comparison will have to be made of the soil of infested and non-infested areas.

Simmonds (H. W.). **The transparent Coconut Scale** *Aspidiotus destructor* **and its Enemies in Southern Pacific.**—*Fiji Dept. Agric., Suva,* Agric. Circ., ii, no. 2, February-May 1921, pp. 14–17.

A brief account is given of the life-history of *Aspidiotus destructor*, which is one of the worst pests of bananas and coconuts in Fiji. The complete life-cycle occupies about 38 days, varying according to weather conditions. The eggs hatch in 7 days, and the larvae crawl about until a suitable spot is found on the leaf, when they settle down and begin at once to suck the plant juices. The scale is chiefly carried by the wind, but is probably also distributed by various mechanical means such as by adhering to the feet of other insects. The most important natural enemies of *A. destructor* are *Chrysopa* spp. Many dead scales are found covered with a black fungus, which may however only appear after death. The common earwig of the banana and a somewhat scarce species of ant are predaceous on the scales. The Chalcid parasites, *Aspidiotiphagus citrinus*, Craw, and *Aphelinus chrysomphali*, Merc., occur in Tahiti, the latter being the more important as all scales attacked by it are completely destroyed. It is also more resistant to extreme heat and has been found on small exposed trees. Scales attacked by *A. citrinus* occasionally lay a few eggs. Continued observations indicate that no secondary parasitism occurs. Closely planted trees and those with a considerable amount of undergrowth appear to suffer less from *Aspidiotus destructor*, possibly because the undergrowth shelters natural enemies such as lacewing flies and earwigs.

Simmonds (H. W.). **Report on the Second Mission to Tahiti.**—*Fiji Dept. Agric., Suva,* Agric. Circ., ii, no. 2, February–May 1921, pp. 18–19.

The Chalcids, *Aphelinus chrysomphali* and *Aspidiotiphagus citrinus,* parasites of *Aspidiotus destructor,* have been introduced from Tahiti into Fiji. It is hoped to establish them at Ovalau and Moturiki, whence they can be shipped to other islands.

Simmonds (H. W.). **Notes on** *Levuana iridescens,* **Beth. Baker.**—*Fiji Dept. Agric., Suva,* Agric. Circ., ii, no. 2, February–May 1921, p. 19.

An outbreak of *Levuana iridescens,* B.B. (coconut leaf moth) in the Nasese district was apparently checked by a fungus. It is proposed to carry out experiments with it and with another fungus attacking an allied moth, *Brachartona catoxantha,* in the Malay States [*R. A.E.,* A, iv, 91].

Carment (A. G.). **Fungus Disease of** *Levuana iridescens.*—*Fiji Dept. Agric., Suva,* Agric. Circ., ii, no. 2, February–May 1921, p. 20.

The action of the fungus attacking *Levuana iridescens* [see preceding paper] cannot be definitely determined until living larvae have been inoculated with the cultures, which have now been prepared. The possibility of infection of the larvae after death is discussed. The present evidence points to the contrary being the case.

Fletcher (T. B.) & Inglis (C. M.). **Some Common Indian Birds. No. 9. The Black-Headed Oriole** (*Oriolus luteolus*) **; No. 10. The Black Drongo or King Crow** (*Dicrurus macrocercus*).—*Agric. Jl. India, Calcutta,* xvi, pts. 3 & 4, May & July 1921, pp. 231–234 & 359–364, 2 plates.

The black-headed oriole (*Oriolus luteolus*) may be considered beneficial to agriculture, as insects form a large portion of its diet. Although it feeds also on fruit, it has not been observed to attack cultivated fruits. It is protected throughout the year in Bombay, United Provinces, Bihar and Orissa, Bengal, Assam, Burma, Madras and Mysore.

The black drongo (*Dicrurus macrocercus*) feeds entirely on animal matter. A large proportion of its diet consists of injurious insects such as crickets, grasshoppers, moths, bugs and insect larvae. It also follows the plough and destroys many cutworms. It is protected by law throughout the whole year in Delhi, United Provinces, Bengal, Assam and Burma. It should be encouraged in cultivated areas by the provision of suitable perches for the birds to rest on.

Meyrick (E.). **Exotic Microlepidoptera.**—ii, pt. 14, May 1921, pp. 417–448. [Published by the author, *Marlborough, Wilts.* Price 3s. per part.]

Of the new species described the following were bred from plants of economic importance :—Punjab : *Dichomeris quercicola,* from *Quercus.* Queensland: *Agriophara levis* from *Eucalyptus siderophloia.* Barbados : *Lecithocera emigrans* from *Ipomoea batatas* (sweet potato).

KING (H. H.). **The Migratory Locust** (*Schistocerca peregrina*, **Oliv.**).—*Wellcome Trop. Res. Lab., Khartoum,* Ent. Bull. 12, July 1921, 14 pp., 7 figs.

Schistocerca peregrina, Ol., is one of the most destructive insect pests in the Anglo-Egyptian Sudan, although during the last few years it has been less abundant than usual. As a series of years in which locusts are relatively scarce may be followed by a series in which they are extremely abundant, every precaution should be taken to prevent an outbreak. It is essential that the Government should organise some definite scheme of control, and this, to be effective, must be supported by the co-operation of the people living in the districts liable to be affected. This necessitates a knowledge of the life-history and habits of the locust, the facts of which are briefly sketched with suggestions for control [*R.A.E.*, A, ii, 94; iii, 461]. A brief outline is also given for the organisation of general remedial measures.

The natural enemies of *S. peregrina* include various birds, the larvae of the Muscid flies, *Stomatorrhina lunata*, F., and *Sarcophaga* sp., and at least one species of Cantharid beetle. The value of *Coccobacillus acridiorum* is extremely limited under local conditions.

Control would be greatly facilitated if it were known what happens to the locusts when they leave the Sudan, whether they breed in the Libyan desert and perhaps return to it, and whether they breed during the winter. Further questions requiring elucidation are: whether *Schistocerca peregrina* ever oviposits in dry soil, the eggs retaining their vitality until the rains begin; whether there are certain definite areas to which the locusts return each year for oviposition; what distance the hoppers can travel during their 40 to 50 days of development; and how long after acquiring wings do they remain pink.

The Locust.—*Wellcome Trop. Res. Lab., Khartoum,* Ent. Bull. 15, 1st June 1921, 1 p., 7 figs.

The life-history of the locust [*Schistocerca peregrina*] is briefly described and illustrated. The discovery of any of its stages should at once be reported to the authorities.

MAZZÀCCARA (G.). **La Cocciniglia del Gelso.** [The Mulberry Scale.]—*Allevamenti, Palermo,* ii, no. 8, 1st August 1921, pp. 237–238.

The life-history and morphology of the mulberry scale, *Diaspis pentagona*, are briefly described. In winter the branches may be brushed with wire brushes, but a better result is obtained by spraying. The following formula is required in Italy by law: Heavy tar oil (specific gravity 1,052) 9 lb., pure Solvay sodium carbonate 4½ lb., and water 10 gals. This must be prepared only a short time before use. Natural control, based on the use of *Prospaltella berlesei*, *Rhizobius lophantae*, and other predaceous and parasitic enemies, has given very gratifying results, but artificial measures should not be entirely abandoned, and it is well to spray with a 2 per cent. solution of tobacco extract any larvae that may be observed.

Pests and Diseases.—*Rept. Grenada Agric. Dept., 1920, Barbados,* 1921, pp. 9–10.

During 1920 the following pests and diseases were reported from Grenada. Attacks by *Heliothrips rubrocinctus*, Giard, on cacao were mild, only a few severe local cases being recorded. The good effects of drainage and proper cultivation combined with spraying are being recognised.

Investigations were commenced concerning the damage caused by *Calotermes balloui* to cacao trees. These trees were also considerably damaged by *Cremastogaster brevispinosa* var. *minutior* (acrobat ant). Control experiments were carried out with flowers of sulphur, calcium arsenate, and borax, in both dust and spray form. Flowers of sulphur killed the greatest number, but did not produce effective control. Negligible results were obtained with poisoned syrups and grease bands.

Sugar-cane was severely damaged in two districts by *Tomaspis saccharina*, Dist. Although in one district the adult froghoppers were heavily infested with fungi, the canes were severely damaged; in the other district the infested field had been ratooned for about sixteen years. Damage was also caused by *Diatraea saccharalis*, F. (cane moth borer) and advice as to control measures was given.

Chionaspis citri, Comst. (orange snow scale) was widespread on limes.

During the dry months of the year coconuts growing in exposed places were attacked by *Aspidiotus destructor*, Sign. (Bourbon scale). *Rhynchophorus palmarum*, L. (palm weevil) was observed in all stages of coconuts dead or dying from red ring disease, and in young plants, where the hearts were often severely damaged. In all districts coconuts were infested with *Aphelenchus cocophilus*, Cobb, the Nematode causing red ring disease, and dead palms were destroyed as a preventive measure. Compulsory measures can now be taken under the Agricultural Interests Ordinance, but have not yet been resorted to.

Pineapple fruits on a badly cultivated holding were considerably damaged by a weevil thought to be a new species. In some cases the crowns were either deformed or absent. A gummy exudation oozed from punctures in the fruits, and the fruit stalks were badly riddled.

Yams were attacked by *Aspidiotus hartii*, Ckll. The foliage wilted, and there was a heavy infestation of the insects on the tubers.

Uvarov (B. P.). **A new Genus and Species of Orthoptera found in a Greenhouse in England.**—*Ent. Mthly. Mag., London,* Third Ser., no. 81, September 1921, pp. 206–209.

Chopardina importata, gen. et sp. n., is recorded from a greenhouse. Another grasshopper, *Tachycines asynamorus*, Adel., often found in greenhouses, has been frequently erroneously recorded as *Diestrammena marmorata*, De Haan [*cf. R.A.E.*, A, v, 98].

Green (E. E.). **Observations on British Coccidae with Descriptions of New Species.**—*Ent. Mthly. Mag., London,* Third Ser., nos. 80 and 81, August and September 1921, pp. 189–200, 7 figs.

The species dealt with include: *Pseudococcus comstocki*, Kuw., on bananas imported from the West Indies; *P. paludinus*, sp., n., on

Eupatorium cannabinum, Symphytum officinale, Urtica, Lysimachia, Convolvulus and *Spiraea* ; *Ripersia europaea,* Newst., on roots of grasses in nests of *Lasius niger* ; *R. halophila,* Hardy, on roots of *Suaeda fruticosa, Statice binervosa* and *Armeria maritima* ; *R. scirpi,* sp. n., at the base of stems of *Scirpus caespitosus* ; *Lichtensia viburni,* Sign., on wild ivy ; and *Lecanopsis formicarum,* Newst., on *Elymus arenarius.*

L. butleri, Green, is a synonym of *L. formicarum,* Newst. ; the species recorded as *L. longicornis,* Green [*R.A.E.*, A, vi, 59], is now referred to the genus *Exaeretopus,* and *Lecanium aequale,* Newst. [*loc. cit.* viii, 343] to *Coccus* (*Lecanium*) *pseudohesperidum,* Ckll.

Other species recorded are : *Eriopeltis festucae,* Boy. ; *Luzulaspis luzulae,* Duf., on leaves of *Luzula campestris* ; *Eulecanium* (*Lecanium*) *capreae,* L., on *Ribes* ; *Pulvinaria vitis,* L., on mountain ash (*Pyrus aucuparia*), aspen (*Populus tremula*), sloe (*Prunus spinosa*) and lime (*Tilia europaea*) ; *Chionaspis salicis,* L., on red currant (*Ribes rubrum*) ; *Lepidosaphes tuberculatus,* Malen., on an orchid (*Cymbidium*) ; and *L. ulmi,* L., on the stem of *Ceanothus veitchi.*

GIBSON (A.). **Financial Values resulting from Entomological Investigations.**—*Agric. Gaz. Canada, Ottawa,* viii, no. 4, July-August 1921, pp. 420–423.

It is difficult to estimate the actual cash values resulting from entomological research in Canada, except on certain lines of investigation, and these are briefly described.

The value of measures against grasshoppers has already been noticed [*R.A.E.*, A, ix, 147], and it is estimated that in Saskatchewan in 1921 a saving of at least £8,000 (at par) will be effected by using sawdust in poisoned baits.

Bark-beetle control work in British Columbia has proved most effective. In 1921 the further spread of infestation will be prevented, thus saving from total destruction 300,000,000 feet of yellow pine, worth more than £1,200,000, at a total cost of less than £10,000. This work was started in the winter of 1919, and consists in modified logging operations by cutting infested trees and the destruction of overwintering broods in the bark, either by using the timber and burning the rubbish, or by burning the entire trees. Previous investigations show that forests in infested areas would have been entirely ruined in the next five years. Near Princetown, the beetles, which have been spreading for eight years, have already killed over 150,000,000 feet of yellow pine, worth £600,000. They also threaten the complete ruin of between one and two billion board feet of timber.

In 1920, in the Annapolis valley, the use of the new copper-arsenic dust for orchard trees saved the growers £4,000, and in the present year a saving of £8,400 is estimated. The substitution of calcium arsenate for lead arsenate in Bordeaux mixture on apples and potatoes saved £3,240 in 1920. The substitution of Bordeaux mixture for lime-sulphur in Nova Scotia secured 200,000 barrels of apples, at an estimated value of £80,000, per year more than had been obtained when the latter mixture was used.

During the last three years the value of corrosive sublimate as a remedy for cabbage root maggot [*Phorbia brassicae*] has been demonstrated in Ontario and British Columbia. At least £10,000 worth of crops were saved in Ontario in 1920. In 1921, in British Columbia, a plantation of 25,000 cabbages thus treated resulted in 100 per cent. of marketable heads.

The rose midge [*Neocerata rhodophaga*] has caused serious losses, particularly in 1919, to roses grown under glass in Ontario, and the value of tobacco dust was demonstrated. Tons of this dust have been used in Ontario, and in 1920 results proved that the investigations were worth £10,000 to the growers.

Hopkins (A. D.). U.S. Bur. Ent. **Intercontinental Problems in Bioclimatics ; with special Reference to National and Artificial Distribution of Plants and Animals.**—*Jl. Wash. Acad. Sci., Washington, D.C.*, xi, no. 10, 19th May 1921, pp. 223–227. [Received 22nd August 1921.]

The principles on which the bioclimatic law is founded, and some of the features in the system of application, are apparently not generally understood. In consequence its scientific and practical value is often underestimated, and the author therefore repeats his interpretations [*R.A.E.*, A, viii, 87].

Hopkins (A. D.). **Bioclimatic Zones of the Continents ; with proposed Designations and Classification.**—*Jl. Wash. Acad. Sci., Washington, D. C.*, xi, no. 10, 19th May 1921, pp. 227–229. [Received 22nd August 1921.]

This paper designates and classifies bioclimatic zones for the continents of the world as suggested in connection with the previous paper. There are three major zones—the Frigid, Temperate and Tropical—which are divided into four, seven and four minor zones respectively. The minor zones may be divided into sections and sub-sections if necessary.

Del Guercio (G.). **Note ed Osservazioni di Entomologia agraria. Notizie preliminari.** [Notes and Observations on Agricultural Entomology. Preliminary Notes.]—*Florence*, Istituto Agricolo Coloniale Italiano, 1918, 282 pp., 230 figs., 1 plate. [Received 14th September 1921.]

Some results of the author's original observations and studies on injurious and beneficial insects are collected in this fully illustrated volume. Many of the papers have been already noticed [*R.A.E.*, A, vi, 488, 530 ; vii, 16, 125, 193 ; viii, 159, 202, 203, 204].

Spermophagus subfasciatus and *Bruchus* (*Bruchidius*) *obtectus*, infesting beans in Italy [vi, 382 ; ix, 281], were observed to be infected by a bacillus of the group causing dysenteric septicaemia. The artificial diffusion and economic value of this bacillus are to be studied. A flacherie was noticed in Cecidomyiid larvae infesting very young pear fruits, in a large number of which 80–90 per cent. of the larvae were infested with the bacillus, which was also found in larvae in the ground. An injurious gall on *Asclepias* sp. received from Eritrea harboured a Cecidomyiid for which the name *Monilipennella trapezospatha*, gen. et sp. n., is suggested. An undetermined Cecidomyiid and its parasite, probably *Inostemma* sp., were obtained from galls on *Solanum melongena* from Eritrea. This is of great economic importance as the egg-plant is extensively cultivated in Italy, and plants with galls do not bear fruit. It is possible that the eradication of the wild food-plants, probably Solanaceae, will prevent infestation of the cultivated species.

In Eritrea the flowers of *Momordica pteromorpha* are infested by a Cecidomyiid, *Perrisia beccariella*, sp. n. Unnamed Chalcids found in these galls are briefly described. In the fruits of *Bryonia* sp. from Eritrea larvae somewhat similar to those of the olive fly [*Dacus oleae*] were seen, and it is possible that the infestation may spread to cultivated Cucurbitaceae.

van Hall (C. J. J.). **Ziekten en Plagen der Cultuurgewassen in Nederlandsch-Indië in 1920.** [Diseases and Pests of Cultivated Plants in the Dutch East Indies in 1920.]—*Meded. Inst. Plantenziekten, Buitenzorg*, no. 46, 1921, 50 pp.

Owing to abundant rains during part of the normal dry season, a number of insect pests did little injury in 1920. Rice borers caused little loss for this reason and were not thought likely to cause much loss in 1921.

As in previous years, potatoes were attacked by a Coccinellid, *Epilachna* sp., while a weevil, *Cylas formicarius* (*turcipennis*) infested sweet potatoes, some of the latter being also defoliated by *Herse* (*Protoparce*) *convolvuli.*

Forest pests included *Duomitus* [*ceramicus*], *Zeuzera coffeae, Phassus* [*damor*] (ring borer), and *Hypsipyla* sp., all previously reported. Among other pests were *Zeuzera postexcisa* on Lauraceae ; *Xyleborus destruens* in teak ; *Xyleborus* spp. in mahogany and *Schleichera trijuga* ; a Coreid bug, *Anoplocnemis* sp., on *Cassia fistula* and other Leguminosae ; a Tingid bug on *Vitex heterophylla* ; *Catopsilia* defoliating *Cassia* sp. ; and a Chrysomelid beetle on *Pluchia indica* grown as a ground-covering in teak plantations. The teak caterpillar, *Hyblaea puera,* appeared to be rare during the wet season.

Cacao in an experimental plot was subject to the nocturnal attack of a beetle, *Adoretus* sp. On some estates, where old wood had not been thoroughly removed, boring beetles, *Xyleborus* sp., proved troublesome.

Cassava suffered, as usual, from mites ; another pest was a scale, *Lepidosaphes* (*Mytilaspis*) sp.

Hevea was infested by *Coptotermes gestroi*, *Acanthopsyche snelleni*, and Liparid caterpillars.

Cotton was injured by *Earias fabia* in most fields.

Kedelé [*Glycine soja*] was again severely attacked by the pod borer, *Etiella zinckenella* ; the stem borer, *Agromyza sojae,* occurred everywhere, but this fly did little injury. Other pests were Chrysomelid beetles, leaf-caterpillars and *Epilachna* sp.

Cinchona was infested by *Helopeltis theivora*, *H. antonii*, the caterpillars of *Euproctis flexuosa* and [*Attacus atlas*], and mites.

Coconuts continued to be infested by *Brachartona catoxantha. Oryctes rhinoceros* did considerable injury in some localities. *Hidari irava* was reported from one district. Psychid caterpillars and those of the Limacodids, *Parasa lepida* and *Belippa laleana*, the Hispid beetles, *Brontispa longissima* and *Plesispa* sp., and the palm weevil, *Rhynchophorus* [*ferrugineus*], also infested coconuts.

Coffee was attacked to an increased degree by *Stephanoderes hampei*, contrary to the hopes previously entertained of limiting this beetle. Other coffee pests included the twig borer, *Xyleborus coffeae* ; the red borer, *Zeuzera coffeae* ; the scales, *Coccus* (*Lecanium*) *viridis*,

Pseudococcus virgatus and another species—probably *P. crotonis*; Psychid caterpillars; a Limacodid, *Belippa laleana*; and the coffee weevil, *Araecerus fasciculatus*.

Phaseolus lunatus was repeatedly attacked by *Agromyza phaseoli*, some crops being destroyed.

Maize pests included the caterpillars of *Heliothis obsoleta* (*armigera*), *Cirphis* (*Leucania*) *unipuncta*, and cutworms.

Oil palms suffered from *Oryctes rhinoceros*, *O. trituberculatus* and *Rhynchophorus* [*ferrugineus*]. The Lepidopterous pests of these palms were *Melissoblaptes rufovenalis*, *Amathusia phidippus*, *Discophora celinde*, *Setora nitens*, and Psychids. The last-named did much damage in some cases.

A small plantation of *Ricinus* was defoliated by the Noctuid, *Achaea janata* (*Ophiusa melicerta*).

Rice pests included *Nymphula depunctalis*, *Schoenobius incertellus* (*bipunctifer*) and *Scirpophaga sericea*; *Spodoptera mauritia*; the bugs, *Leptocorisa acuta*, *Nezara viridula*, and *Podops vermiculata*—of which the last-named did considerable harm in Sumatra; and *Tetraneura oryzae*; as well as locusts, grasshoppers and crickets.

Tobacco was attacked by the caterpillars of *Heliothis*, *Phytometra* (*Plusia*) and *Prodenia*. Now that the accumulated stocks of baled leaf have been shipped the infestation by *Lasioderma serricorne* and *Setomorpha margalaestriata* is of less importance.

Tea was attacked to some extent by the caterpillars of *Attacus atlas*, *Belippa laleana* (*Nemeta bohor*), *Acanthopsyche snelleni*, *Stauropus alternus*, a large Liparid, Psychids, the Limacodids, *Thosea cervina* and *Setora nitens*, and *Andraca bipunctata*. *Helopeltis theivora*, *H. antonii*, the Pentatomid bug, *Cantheconidea robusta*, an unidentified Capsid, *Hyalopeplus smaragdinus*, and the tea-seed bug, *Poecilocoris hardwicki*, also infested tea, other pests of which were a Curculionid, *Corigetus scapularis*, Coccids, *Zeuzera coffeae* and other borers, and the tea-seed fly, *Adrama determinata*.

Mangos were extensively attacked by the mango fly, *Dacus ferrugineus*.

Duport (M. L.). **La Station pour l'Etude du Borer du Caféier au Tonkin et les premiers Résultats de ses Travaux.**—*Bull. Agric. Inst. Sci., Saigon*, i, no. 2, February 1919, pp. 33–40. [Received 29th August 1921.]

The bulk of the information given here has already been noticed [*R.A.E.*, A, vii, 269, 518].

Great variations in size, shape and colour are met with in *Xylotrechus quadripes*, Chevr., so that many species of this genus described from the Far East may prove synonymous. *X. sappho*, Pasc., is considered by Wallace a synonym of *X. javanicus*, Cast. & Gory, and the latter will probably prove to be identical with *X. quadripes*, Chevr., for the specimens received by the author from Java are very similar to the species found in Tonkin on *Coffea arabica* and, especially, on *C. liberica*.

Very shady situations are distasteful to the females. This has been clearly shown in the laboratory, and in plantations the least shaded places appear to suffer most.

Experiments to determine the length of the life-cycle in Tonkin are in progress; in the case of eggs deposited on living coffee bushes

from May to August it is at least 4–8 months. In the laboratory a period of three months was observed. The duration of the life-cycle depends on the date of oviposition, the vitality of the larvae and the character of the infested wood. Oviposition has been observed in pieces of branches of *Albizzia*.

X. quadripes seems to do more harm in Tonkin than in any other country in the Far East.

Robin (J.). **La Culture du Cocotier dans l'île de Phu-tuc (Cochinchine).**—*Bull. Agric. Inst. Sci., Saigon*, i, no. 7, July 1919, pp. 201–207. [Received 29th August 1921.]

Coconuts in the island of Phu-tuc, in the Mekong Delta, are attacked by rhinoceros beetles (*Oryctes*), which, however, do serious harm only on the fringe of the plantations and in those that are badly looked after. When growing in dense masses the palms are never attacked, because the flight of the beetles is impeded.

Vincens (F.). **Trois Microlépidoptères ennemis des Riz fréquents en Cochinchine.**—*Bull. Agric. Inst. Sci., Saigon*, ii, no. 4, April 1920, pp. 97–105, 2 plates. [Received 29th August 1921.]

This paper on *Schoenobius incertellus, Chilo suppressalis* and *Cnaphalocrocis medinalis*, has already been noticed from an abstract in another journal [*R. A.E.*, A, viii, 451].

Vincens (F.). **La grande Psyché du Cocotier.**—*Bull. Agric. Inst. Sci., Saigon*, iii, no. 1, January 1921, pp. 26–29, 1 plate. [Received 29th August 1921.]

Coconuts in Cochin China are attacked by a large Psychid, and in some cases very severe defoliation has occurred, hundreds of cocoons being seen on a single frond. Caterpillars collected in January yielded adults in March ; only a few adults emerged, as the caterpillars were heavily parasitised. There appears to be only one generation a year. It is probable that the females, which are wingless, remain in their case, and that oviposition takes place there, the eggs hatching after several months. The place where the eggs are deposited and the date of hatching are unknown.

An arsenical spray against the caterpillars, and the collection and burning of infested fronds against the eggs and pupae are suggested. As immediate burning would destroy the parasites, the fronds should be stored in containers fitted with a wire gauze screen permitting them to escape. At least one important natural enemy known in Cochin China is a Tachinid fly, which was so effective in 1919 in one district as to prevent pupation in the majority of cases.

This method of promoting the increase of parasites should be useful against coffee borers (*Xylotrechus*) in Cochin China, as their parasites, observed by Duport in Tonkin, probably occur in the former country also.

Vincens (F.). **La Chenille rose des Capsules du Coton.**—*Bull. Agric. Inst. Sci., Saigon*, iii, no. 4, April 1921, pp. 111–115, 2 plates. [Received 29th August 1921.]

This article describes the bionomics and control of *Platyedra* (*Pectinophora*) *gossypiella*, which has been reported from Siam and China.

Although it has not been observed in Indo-China it may exist there, especially as it occurs in neighbouring countries and no measures have been taken to prevent its introduction.

Kieffer (J. J.). **Sur divers Hyménoptères destructeurs des Cérambycides nuisibles au Caféier et au Bambou.**—*Bull. Agric. Inst. Sci., Saigon,* iii, no. 5, May 1921, pp. 129–140. [Received 29th August 1921.]

This paper deals with the Hymenopterous parasites of *Xylotrechus quadripes,* Chevr. (coffee borer) and *Chlorophorus annularis,* Fairm. (bamboo borer) that are being utilised to combat these Cerambycids in Tonkin [see next paper].

A key is given to the new Braconids : *Duportia cincticornis,* gen. et sp. n., from *C. annularis* ; *Promiscolus sesquistriatus,* gen. et sp. n., from *X. quadripes* and *C. annularis* ; *Pristoloryctes striativentris,* gen. et sp. n., from *X. quadripes* ; and *Doryctes tristriatus,* sp. n., *D. strioliger,* sp. n., *D. picticeps,* sp. n., *D. bistriatus,* sp. n., and *D. brevipetiolus,* sp. n., all of which parasitise both Cerambycids.

Descriptions are also given of an Ichneumonid, *Paraglypta tubigera,* gen. et sp. n., from *X. quadripes* ; an Evaniid, *Pristaulacus nigripes,* Kieff., var. *duporti* n., from *X. quadripes* ; and the Bethylids, *Sclerodermus domesticus,* Latr. (an ectoparasite of the larvae of both Cerambycids, which also destroys the larvae and adults of the Braconids named above) and *Mysepyris grandiceps,* sp. n., from *X. quadripes.*

Duport (L.). **Rapports sur les Recherches poursuivies à la Station Entomologique de Cho-Ganh.**—*Supplements to Bull. 130 & 131, Chambre d' Agric. Tonkin & Nord-Annam, Hanoi,* nos. 11 & 12, September-December 1920, January-March 1921, 8 pp. & 5 pp. [Received 2nd August 1921.]

Recent work in connection with the parasites of the larvae of *Xylotrechus quadripes,* Chevr., is reviewed. *Doryctes strioliger* is apparently the most important Braconid parasitising this coffee borer ; others are *D. picticeps,* Kieff., which was fairly abundant in 1919, and *D. tristriatus,* Kieff., which although widely distributed is of very little importance. The Braconids, *Promiscolus sesquistriatus,* Kieff., and *Pristodoryctes striativentris,* Kieff., have also been reared on infested coffee plants. The Evaniid, *Pristaulacus nigripes* var. *duporti,* Kieff., apparently increases naturally on coffee plants in certain districts, and in greater abundance than the Braconids.

The Bethylids recorded are *Sclerodermus domesticus,* Kieff., and *Mysepyris grandiceps,* Kieff. An Ichneumonid, *Paraglypta tubigera,* Kieff., was taken from the trunks of coffee plants, and a species, which appears to be identical with *P. tubigera,* has been reared from *Chlorophorus annularis.* The parasites of *C. annularis* on dry bamboo are the above-mentioned Braconids as well as *Duportia cincticornis,* Kieff., and a Bethylid. Later observations show that a Braconid, *Doryctes* sp., that breeds under natural conditions on the larvae of another beetle, *Trachelobrachys elegans,* Fairm., living under the bark of the dead wood of *Aleurites cordata,* apparently also attacks *X. quadripes,* though further investigations are necessary to confirm this.

Cutting down and burning the diseased stems early in March is advocated. By this means the emergence of numerous insects is prevented.

Investigations are still in progress concerning the habits of rice pests. The most common of these are the moths, *Schoenobius incertellus*, Wlk., and *Cnaphalocrocis medinalis*, Gn., which hibernate in the stubble at its base. The pupae are very resistant and develop equally well in the dry stubble or when exposed to extremes of temperature or prolonged humidity. They are apparently not attacked by other insects.

Annual Report of the Department of Agriculture for the Year 1920. *Mauritius*, 1921, 19 pp.

In this report for the year 1920 an important decrease has been recorded in Mauritius of *Lachnosterna* (*Phytalus*) *smithi* [*R. A.E.*, A, ix, 145]. The special export tax was levied on all sugars leaving the Colony to defray the expenses of campaigns against this pest, and by this means upwards of £5,000 were available in 1920.

Oryctes tarandus is reported to be less in evidence in places where it was formerly a serious pest. The parasite, *Scolia oryctophaga*, imported from Madagascar in 1917, has established itself, except on cultivated lands. Among minor pests, the mango Cecidomyiid fly [*Procontarinia matteiana*, Kieff.] has spread over a wider area.

Plant inspection was carried out, together with fumigation and treatment of consignments of plants.

Gray (G. P.). **The Present Status of Lime-sulphur Solution vs. Dry Materials.**—*Mthly. Bull. Cal. Dept. Agric., Sacramento*, x, nos. 5–6, May–June 1921, pp. 177–182.

The author, who was among the first to publish an analysis of lime-sulphur in powder form as an orchard spray, is still of the opinion that when dissolved it forms a spray similar to the usual lime-sulphur solution, provided equivalent quantities are used.

The first firm to place this powder on the market claimed that the amount of the new powder dissolved in water would only need to contain about half the active ingredients of the old lime-sulphur solution, as certain organic material in the dry compound prolonged the effectiveness of the spray, thereby reducing the amount of sulphur required. These views were not accepted, and fruit growers were advised to continue to use the old spray until experiments proved the new one more efficient. The same attitude was taken in respect of compounds of soda and sulphur and the barium-sulphur compounds, for which similar claims had been made.

The points to be decided are whether satisfactory results can be obtained by following the manufacturer's directions, and whether the components of the dry compounds are twice as effective as the same substance in the commercial lime-sulphur solution.

Owing to the war, few comprehensive experiments have been carried out. The published data on the first question are contradictory, partly owing to the different climates and types of insects and fungi experimented upon, and to uncertainty as to the composition of the materials used. Data on the second question are of doubtful value if the composition of the materials used is assumed to be, as stated on the label or by analysis, other than those actually used. Owing to imperfect regulatory laws, the composition of materials in experiments may differ from those guaranteed on the labels. Instances are given when material supplied for experiments was superior to the average commercial product.

A review of published reports of comparative tests of sprays made from lime-sulphur solution, dry lime-sulphur, dry soda-sulphur and dry barium sulphur are given. Comparative spraying tests were carried out on *Aspidiotus perniciosus* (San José scale) at Washington in 1917 and 1918, in which the dry form compared favourably with the liquid. Excellent results are reported from Illinois with 15 lb. dry lime-sulphur to 50 U.S. gals. water, and 12½ lb. soda-sulphur to 50 U.S. gals. water, and fair to good results from 14 lb. barium sulphur to 50 U.S. gals. water, while the results from a commercial solution said to contain double the amount of active sulphur were only rated as good. The result of experiments in New Jersey on Aphid eggs are given [*R. A. E.*, A, viii, 30]. The following sprays were tested on the eggs of *Bryobia praetiosa*: Concentrated commercial lime-sulphur solution diluted 1 in 8, 1 in 10, 1 in 12 and 1 in 15; 13 lb. and 6½ lb. barium sulphur to 50 U.S. gals. water; 6 lb., 10 lb. and 15 lb. dry lime-sulphur to 50 U.S. gals. water. A hundred per cent. kill was recorded from all lime-sulphur solutions.

From comparative tests on rust mites in Florida it was concluded that dry sulphur compounds used on the basis of their sulphur content give satisfactory results in controlling this pest. In tests where the sulphur in solution was less than that contained in lime-sulphur solution, the latter was superior. Future experiment may show that these can be used slightly under the sulphur content basis.

Though the question has not been settled, the author considers from the evidence collected, that practically the same results will be produced from the application of the same sulphur compounds whether purchased in solution, as the commercial 33° Bé. lime-sulphur solution, or as dry powder. Experiments to prove this contention will not be convincing unless the composition of the actual materials under test is known. A few instances are given of how the composition may change and deteriorate.

De Ong (E. R.). **Suggestions for the Control of Red Spiders in Deciduous Orchards.** — *Mthly. Bull. Cal. Dept. Agric., Sacramento,* x, nos. 5–6, May–June 1921, pp. 186–191, 2 figs.

The common red spider (*Tetranychus telarius*, L.) hibernates in the adult and nymphal stages among leaves and in the soil. In sheltered places the mites may feed on hardy plants such as *Convolvulus arvensis* and *Malva parviflora*. They migrate in spring to orchard trees and other plants, feeding on the lower surface of the leaf, where also the eggs are laid.

Remedial measures recommended are the destruction of winter-growing weeds before they mature in order to delay infestation. Peas, vetches and grain crops seldom harbour this pest, and should be cultivated where possible. The trees should be irrigated before any signs of drought. Where the pest is common, sulphur in liquid or dry form should be applied when the attack usually begins, this being the end of June and early July in Sacramento. A liquid spray is more satisfactory, as one thorough application is enough. It can be made by mixing dry sulphur with glue water or flour paste, or by using sulphur pastes or wettable sulphurs. About 5 lb. sulphur should be used to every 100 U.S. gals. spray mixture. The sulphur-glue mixture consists of 5 lb. sulphur (flowers or sublimed), ¾ oz. dry glue dissolved in 1½ U.S. gals. hot water, and 100 U.S. gals. water. The sulphur and glue water mixed into a paste should be rubbed through a sieve into the spray tank. Flour paste may be substituted for glue

water. For large trees 8–10 gals. are necessary to cover every leaf, and in spraying prunes the lower surface of the leaf should be wetted.

The following is recommended for heavy infestation in cool weather: 2 U.S. gals. lime-sulphur (31°–33° Bé.) on almonds (on prunes and peaches 1 gal.), 3 lb. wet or 2 lb. dry flour paste, 5 lb. sulphur, and water to make 100 U.S. gals.; 5 lb. dry lime-sulphur to 100 U.S. gals. may be substituted for the liquid lime-sulphur solution. This combination spray acts more quickly than sulphur alone. Lime-sulphur solutions are caustic and should not be used at a temperature above 100° F., unless it is unavoidable in cases of severe infestation.

Dusting with dry sulphur has not been so successful in the last two years, but it is quicker to apply except in windy weather. If a 10 per cent. filler of hydrated lime or powdered kaolin is added, the sulphur will flow more freely and be just as effective. More than 10 per cent. of filler retards action.

The citrus red spider, *Tetranychus citri*, McGregor, is occasionally found on deciduous trees in the summer. The remedial measures are similar to those for *T. telarius*, except that spraying may have to be done in May or June. The brown mite, *Bryobia praetiosa*, Koch (*pratensis*, Garm.), frequents the leaf scars of the twigs. The winter is passed in the egg-stage on the older twigs and fruit spurs. There is no migration. The most effective measure is winter spraying with 12 or 15 gals. crude oil in 100 gals. spray mixture. Lime-sulphur solution 1 in 10 or dry lime sulphur solutions are almost as efficient as crude oil. They should be applied just before the blossoms appear; the oil spray 3 or 4 weeks earlier, and when there has been no drought or drying winds. Lime-sulphur solutions are of value as fungicides and in controlling *Anarsia lineatella*. Distillate oils prepared as emulsions or miscible oils have proved inferior to crude oils. Spring and summer measures are similar to those for *T. telarius*. Dusting with sulphur proved valueless till summer temperatures were reached.

DE ONG (E. R.) & WOODWORTH (H. E.). **A Co-operative Campaign to save the Horse Bean Crop.**—*Mthly. Bull. Cal. Dept. Agric., Sacramento*, x, nos. 5–6, May–June 1921, pp. 199–203, 2 figs.

Broad beans were very severely infested in 1918 by *Bruchus rufimanus*. Late planting had been recommended as a remedial measure, but was impracticable in many districts. In interior valleys, beans planted in March result in a small crop, as in hot weather the bloom is not fertilised, and in all districts late-planted crops are liable to severe Aphid attacks. On the coast the planting date has to be regulated by the rainfall.

Fumigation experiments for seed beans and export stocks showed that a minimum dosage of 10 lb. carbon bisulphide per 1,000 cu. ft. with 24 hours' exposure was necessary for fumigation in air-tight rooms. For freight cars and improvised rooms this was changed to 20 lb. for 48 hours' exposure. No appreciable injury to germination occurred. Grinding infested beans in feed mills was found impracticable. Exposure of 4–5 hours at a temperature of 125° F. kills all the beetles; quicker results are obtained with 150°–160° F., but germination may be injured.

STRONG (L. A.). **Quarantine Division. Reports for the Months of March and April 1921.**—*Mthly. Bull. Cal. Dept. Agric., Sacramento,* x, nos. 5–6, May–June 1921, pp. 210–215.

The pests intercepted during March and April were :—From South America, *Lepidosaphes beckii* on grapefruit and oranges, and *Tribolium confusum* on hemp seed. From Central America, *Lepidosaphes* sp. on croton ; *Pseudococcus* sp., *Aspidiotus cyanophylli, A. cydoniae, Chrysomphalus aonidum, C. scutiformis* and *Selenaspidus articulatus* on bananas ; *S. articulatus* on coconuts ; *Ischnaspis longirostris* on coffee leaves ; *L. beckii* on oranges ; and undetermined Lepidoptera on beans. From Mexico, *Calandra* (*Sitophilus*) *oryzae, Laemophloeus pusillus, Gnathocerus* (*Echocerus*) *maxillosus* and *Sitotroga cerealella* in corn ; *Heliothis* (*Chloridea*) *obsoleta* in tomatos ; *Chrysomphalus aurantii* and *L. beckii* on oranges ; *Parlatoria cinerea* on limes ; *Heilipus lauri* in avocado seeds ; and *Calandra oryzae* in garvanzos. From Oregon, *Cydia* (*Laspeyresia*) *pomonella* in apples ; and *L. beckii* and *Parlatoria pergandei* on grapefruit. From Washington, *C. pomonella, Aspidiotus perniciosus* and eggs of *Tetranychus* sp. on apples. From Florida, *Hemichionaspis minor* and *Aspidiotus* sp. on coconuts ; and *L. beckii, Chrysomphalus aonidum,* and *P. pergandei* on grapefruit and oranges. From Texas, *Dialeurodes* (*Aleurodes*) *citri* on *Gardenia*. From Illinois, *L. beckii* on grapefruit ; *Pseudococcus* sp. on *Begonia* ; and *L. beckii* and *Eriophyes oleivorus* on oranges. From New York, *Heterodera radicicola* on raspberry roots ; and *L. beckii* and *Parlatoria* sp. on Florida grapefruit. From Pennsylvania, *Pseudococcus longispinus* on *Aspidistra*. From Louisiana, *Lophocateres pusillus* in sweet potatoes. From Kansas, *Aegeria exitiosa* in peach stock. From Hawaii, *Saissetia nigra, Coccus longulus,* and *Howardia biclavis* on *Hibiscus* ; *Bruchus* (*Mylabris*) *limbatus* in acacia seeds ; *Gnathocerus* (*Echocerus*) *cornutus, Pheidole* sp. and *Pseudococcus* sp. on sugar-cane ; *Phenacaspis eugeniae* and Lepidopterous larvae on kukui nuts ; undetermined Coccids on ti-wood ; *Aspidiotus cydoniae, A. persearum, Hemichionaspis minor, Chionaspis inday, Ripersia palmarum, Chrysomphalus aonidum,* larvae of *Hyposcoma* sp. and *Prenolepis* sp., and undetermined thrips on coconuts ; *Coccus elongatus* and an undetermined Aphid on betel leaves ; *Diaspis bromeliae* and *Pseudococcus bromeliae* on pineapples and bananas ; larvae of *Ceratitis capitata* in mangos and coffee-berries ; weevils and Lepidopterous larvae in tree seed ; and Lepidopterous larvae on pineapples and coconuts. From Idaho, *C.* (*L.*) *pomonella* in apples. From Ohio, *Saissetia hemisphaerica* on ferns ; and *Myzus rosarum* and *Tetranychus telarius* on rose plants. From Minnesota, *Parlatoria pergandei* on grapefruit. From Porto Rico, *L. beckii* on grapefruit. From Iowa, *Heterodera radicicola* on raspberry roots. From British Colombia, Lepidopterous larvae in pussy willow. From Kentucky, *Eriosoma lanigerum* on apple trees. From Missouri, *Pseudococcus* sp., and an undetermined Coccid and Aphid on various plants. From Tennessee, *L. beckii* and *Chrysomphalus aonidum* on Florida grapefruit. From North Carolina, *Aspidiotus perniciosus* and *C.* (*L.*) *pomonella* on apples ; and *Lepidosaphes beckii, Pseudococcus longispinus* and *Saissetia hemisphaerica* on ornamentals. From Argentina, undetermined beetles in sample packages of various legumes. From Connecticut, *Pseudococcus citri* on *Gardenia*. From Georgia, *Dialeurodes citri* on *Gardenia*. From Tahiti, *L. beckii* on oranges. From Java, *Lophocateres pusillus* in cotton seed. From Jamaica, *Lepidosaphes beckii*

on oranges. From Japan, *Ceroplastes floridensis*, *Lepidosaphes ulmi*, and *Aspidiotus perniciosus* on pear cuttings; bagworms on *Azalea*; and Lepidopterous larvae on *Rhodea*. From New Zealand, *Hemichionaspis minor* on ornamental plants.

UICHANCO (L. B.). **New Records and Species of Psyllidae from the Philippine Islands, with Descriptions of some preadult Stages and Habits.**—*Philippine Jl. Sci., Manila*, xviii, no. 3, March 1921, pp. 259–288, 5 plates. [Received 23rd August 1921.]

The fourteen species of Psyllids recorded from the Philippines include three that are new and two new varieties, while a new genus, *Haplaphalara*, is erected. *Haplaphalara dahli*, Rübs., is recorded on *Thespesia populnea* and *T. macrophylla*; *Pauropsylla udei*, Rübs., on *Ficus variegata*; *P. triozoptera*, Crwf., and *Paurocephala psylloptera*, Crwf., on *Ficus ulmifolia*; and *P. psylloptera* var. *maculipennis*, n., on *Ficus nota*.

LIGHT (S. F.). **Notes on Philippine Termites, I.**—*Philippine Jl. Sci., Manila*, xviii, no. 3, March 1921, pp. 243–257. [Received 23rd August 1921.]

This is the first of a set of notes intended to cover the systematic field of the subject, after which the results of more extensive economic and ecologic investigations are to be published.

A list of 33 termites recorded from the Philippines is given, nine genera being represented. *Microcerotermes losbañosensis*, Ash., and *Termes* (*Macrotermes*) *copelandi*, Ash., appear to be the commonest and most widely distributed species.

FISHER (W. S.). U.S. Bur. Ent. **New Coleoptera from the Philippine Islands: Family Buprestidae, Tribe Agrilini.**—*Philippine Jl. Sci., Manila*, xviii, no. 4, April 1921, pp. 349–447. [Received 31st August 1921.]

Keys are given to the genera of AGRILINI, as well as to the species of the genera *Neosambus*, gen. n., *Agrilus*, *Coraebus*, *Sambus*, *Trachys*, *Aphanisticus*, and *Endelus*.

Over 90 species in all are dealt with, of which 74 are described as new. *Agrilus occipitalis*, Esch., has been reported as injurying branches of lemon and orange trees, and other species will probably be found to be of economic importance when their habits are known.

FOËX (E.). **De la Préservation des Semis et des jeunes Végétaux contre les Maladies Cryptogamiques et les Parasites animaux par la Stérilisation du Sol.**—*Jl. Soc. Nat. Hortic. France, Paris*, xxii, July 1921, pp. 242–254.

The best method of sterilising soil to protect seed and young vegetables from fungous diseases and insect pests is by steam. By this means Nematodes and bacteria are also destroyed. Carbon bisulphide is a good insecticide and destroys Nematodes, but is ineffectual against fungi. Formol is a good antiseptic, but gives inferior results compared with steam. The expense of these disinfecting agents

unfortunately prohibits their use except in special cases and in small areas. The discovery of some less costly procedure, which could be applied on a larger scale and to many kinds of crops, would be of great advantage in the campaign for plant protection.

THILLARD (R.). **La Culture du Tabac de Sumatra au Cameroun.**—*Agron. Colon., Paris,* vi, no. 43, July 1921, pp. 23–40, 3 figs.

Tobacco that has been fermented and is waiting in the yards for sorting, classification and packing, is liable to attack by insects, of which the chief is [? *Lasioderma serricorne*]. This species multiplies very rapidly, devouring the leaves and causing much damage, sometimes riddling the bundles through and through. The eggs are laid between the leaves, and the larvae pupate in cocoons. Infestation is generally worst in the dry season. Another pest [probably *Dermestes lardarius*] causes very similar damage. Both of these beetles occur generally in tobacco heaps that are not sufficiently fermented and of which the temperature is less than 50° C. To prevent damage the heaps should be isolated, and each year, after the tobacco has been cleared away, the floors where fermentation has taken place should be washed down with boiling water or copper sulphate. When infestation is discovered, it is a good plan to remove all the tobacco, so that the floor and walls may be thoroughly cleaned, and it should not be put back until all the insects have disappeared. In the case of small quantities only, tobacco should be enclosed in hermetically sealed cases and fumigated with sulphur ; the same method may be used in the store-yards if great care is taken. Other preventive measures include washing the floors with paraffin and water, whitewashing the walls with lime, and removing all tobacco debris from the yards each year.

BALLOU (H. A.). **Report on a Visit to Grenada.**—*Agric. News, Barbados,* xx, no. 503, 6th August 1921, pp. 250–251.

A visit was made to Grenada in April–May 1921 to investigate the damage by black ants and mealy-bugs in the cacao plantations and to consider remedial measures. The most abundant mealy-bug is *Pseudococcus citri,* which occurs on the leaves, pods and flower-cushions, and the leaves and bark of suckers. The chief damage seems to be to the pods and flower-cushions; some trees produce abnormally large cushions bearing numbers of flowers, but producing very few pods, apparently as a result of mealy-bug attack. Black ants are present in numbers, both where mealy-bugs occur and where they do not. Tests have been made of spraying against both of these pests, and the results will be reported later. The most satisfactory remedy for black ants consists of the removal of nesting places on the trees ; thorough cleaning of the trees, treatment of old wounds, and removal of hiding-places, together with sprays for mealy-bugs, should result in satisfactory control. During the last few years a large termite has been attacking cacao in Grenada, forming a nest or colony that has no connection with another on the ground or in another tree, and constructing no covered galleries in which to travel from place to place. The insects invade the trees through wounds, where decay has started, and penetrate into healthy tissue, often causing severe damage. Attack is seldom serious except in neglected plantations, and the remedy lies

in cleaning all old wounds and cutting out all the infested wood. All healthy tissue thus exposed should be covered with a protective dressing such as paint, tar, resin oil and tar, or Trinidad crude oil.

Pineapples were damaged in 1920 by the attacks of a large weevil, black in colour with delicate white lines. The weevils hide in the day in the axils of the leaf. The larvae live in the stalk of the fruit, tunnelling through its entire length and even penetrating into the fruit and crown. The adults puncture the stalk, fruit and crown, and the suckers at the base of the fruit. Well-cultivated plants, kept free from weeds and from shade, have never been found to be attacked.

WELLHOUSE (W. H.). **The Hawthorn Blossom Weevil** (*Anthonomus nebulosus*, **Lec.**).—*Ann. Ent. Soc. Amer., Columbus, Ohio,* xiv, no. 2, June 1921, pp. 141–144, 1 fig.

Anthonomus nebulosus, Lec., is one of the most injurious insects found on hawthorn, the larger flowered species, such as *Crataegus punctata, C. brainerdi, C. pruinosa* and *C. mollis*, being apparently preferred as food-plants. This weevil is probably to be found wherever the food-plants exist east of the Rocky Mountains. There is no record of its occurrence outside North America.

The weevils hibernate in curled, dried leaves on the ground beneath the food-plant. About mid-April they appear on the tree and feed ravenously on the green buds. Feeding continues during suitable weather until the clusters have separated enough for oviposition. The weevils are inactive at temperatures below 50° F., the optimum temperature ranging from 60° to 70° F. Provided the temperature is sufficiently high, they will feed during rainy or cloudy days and at night. Oviposition occurs about 15th May at Ithaca and coincides with the period between the opening of the blossom clusters and the opening of the blossoms themselves. The eggs are deposited in the blossom buds and hatch in about a week. The larva develops inside the bud, feeding on all the internal parts of the flower, and pupates after about a fortnight. The adults emerge about a week later, and begin at once to feed on the young thorns or fruit. They have never been noticed feeding on leaves or tender twigs, although occasionally found attacking succulent globular leaf galls of Cecidomyiid larvae. In captivity they also feed on young apples. They enter hibernation about July. Their natural enemies include birds, especially sparrows, and the parasites, *Catolaccus hunteri*, Cwfd., *Sigalphus* sp., and *Habrocytus piercei*, Cwfd.

MUIR (F.). **The Fern Weevil in Australia.**—*Hawaiian Planters' Record, Honolulu,* xxv, no. 1, July 1921, pp. 2–3.

A consignment of a parasite of the fern weevil, *Syagrius fulvitarsis*, has been received in Honolulu from New South Wales. This parasite has been identified as belonging to the genus *Ischiogonus*. Several adults have been liberated and others kept for breeding in captivity.

A letter from Mr. Pemberton, who sent the parasites from New South Wales, gives an account of his observations on them. He is convinced that *S. fulvitarsis* is a native species there, and though widely distributed, is kept well under control by the parasite. The normal parasitism of the larvae was only about 10 per cent., but a rapid increase of the weevil can easily raise this percentage.

The female of *Ischiogonus* sp. deposits from one to five eggs on the host larva, but they are deposited singly, the ovipositor being forced

through the fern stem and partly paralysing the larva within. The larvae hatching from these eggs wander over the surface of the host larva, feeding externally upon it and extracting the body-fluid. The parasitic larva then spins a white cocoon over or near the remains of its host, pupates there, and, emerging as an adult, gnaws its way out of the fern stem. Mating occurs immediately after emergence.

Schurmann (G. B.). **Informe acerca del** *Aphelinus mali*, **Parásito que ataca al Pulgón lanígero.** [Concerning *Aphelinus mali*, a Parasite of *Eriosoma lanigerum*].—*Rev. Minist. Indust., Montevideo*, viii, no. 52, 1920, pp. 149–153. [Received 29th August 1921.]

The author has for some time past been studying the question of the introduction into Uruguay of *Aphelinus mali*, Hald., the Hymenopterous parasite of *Eriosoma lanigerum*. A study of its activities in other countries, particularly in North America and in France, has led to the conclusion that its beneficial action has been exaggerated and is variable. Moreover, its introduction into Uruguay from these countries presents considerable difficulty owing to seasonal differences. It is thought, however, that the parasite would be a useful help in control, and it is hoped to make the experiment of introducing a small number by post.

Schurmann (G. B.). **Sobre una Cochinilla parásita de los Naranjos, Limoneros y Tangerinos en el Uruguay.** [A Coccid Pest of Oranges, Lemons and Tangerines in Uruguay.]—*Rev. Minist. Indust., Montevideo*, viii, no. 52, 1920, pp. 153–164, 8 figs. [Received 29th August 1921.]

Chionaspis citri, Comst., was unusually abundant in Uruguay during 1920 and caused much damage to orange trees. The stages of this Coccid and the nature of the injury are described. During the winter only eggs are found, the first larvae appearing about the middle of September or beginning of October. The number of generations in Uruguay has not been determined, but must be two or three. The fruit and leaves are not often attacked, infestation being confined to the trunk and branches, and as yet no great harm has been done, though if the numbers continue to increase serious damage may result. Old, sickly trees are particularly liable to attack, and badly infested branches break off.

Various insecticide sprays consisting of an emulsion of kerosene, soap and water are recommended, with suitable apparatus for applying them. The first spraying should be done in early October, when the first larvae appear, and should be renewed two or three times at intervals of two or three weeks. In August a more concentrated form of the insecticide should be used, or 5 lb. of quicklime (minimum purity 90 per cent.) with 4 lb. powdered sulphur in 10 gals. water may be substituted.

Brues (C. T.). **Insects and Human Welfare. An Account of the more important Relations of Insects to the Health of Man, to Agriculture, and to Forestry.**—*Cambridge, Mass.*, Harvard Univ. Press; and *London*, Humphrey Milford, 1920, xii+104 pp., 42 figs., Price $2.50. [Received 27th September 1921.]

This volume presents some of the principles and practices of applied entomology in a form illustrative of the biological relationships of

insects to their environment; but few of the details to be found in various other, larger, and more or less encyclopaedic treatises are included, and matters not directly necessary for a brief consideration of insects as they affect human welfare are avoided.

The broader questions relating to food-habits, distribution, and both natural and artificial control of agricultural pests are discussed under the heading "Insects and the Food Supply," and a chapter on "Forest Insects" emphasises the difference between problems encountered under forest conditions and those in dealing with pests of herbaceous plants. Stress is laid on the necessity for discovering in as great detail as possible the life-history and economic relations of a vast series of insects, in order to prevent the misapplication of control measures.

In calling attention to the rapid spread over North America of the European cabbage butterfly (*Pieris rapae*) and the fact that it has largely replaced the native species, a curious error occurs in the illustration on page 44. The American species figured as *Pontia philodice* is *Colias philodice*, whereas the insect intended is *Pieris* (*Pontia*) *protodice*.

The biological method of reducing the numbers of noxious insects offers, at present, the most promising field in which to speculate concerning the future development of entomological practice, to which the concluding chapter is devoted.

DESOIL (P.). **Note zoologique sur la Larve d'*Anthrenus museorum*, L., à propos de ses Dégats dans les Magasins de Laine de Roubaix.**—*C. R. Soc. Biol., Paris*, lxxxv, no. 27, 23rd July 1921, pp. 508–510.

The larvae of *Anthrenus museorum*, L., here described, do serious injury to wool and the bobbins on which it is wound in a wool factory at Roubaix. Only pure wool is attacked, never cotton or mixtures of wool and cotton. Apparently the best quality and that of white colour is preferred. During the German occupation the building was used to shelter horses and their harness and camp equipment, and it is probable that the building became infested with this beetle in consequence.

TAILLEFERT (A.). **Les Larves "Fils de Fer" et les Moyens de les combattre dans les Champs de Céréales.** [Remedial Measures against Wireworms in Cereal Crops.]—*La Terre Vaudoise, Lausanne*, xiii, no. 32, 6th August 1921, pp. 343-345, 1 fig.

Wireworms were more than usually destructive to autumn-sown cereal crops in Switzerland in the spring of 1921, and it is suggested that land found to be infested should be well rolled until the soil is compact and prevents the larvae from moving easily. The ground should then have a top-dressing of 704 to 880 lb. of kainit per acre, mixed with 264 to 440 lb. of quicklime. A greater quantity than this is apt to injure the crop. The use of the lime is almost entirely for the sake of preventing the formation of crusts on the surface of the ground, due to the use of potassium salts. Where crops are already seriously injured the use of sodium nitrate with the kainit is recommended; this does not injure the wireworms, but strengthens the young plants that have not been attacked. Diluted liquid manure can be substituted for the sodium nitrate, if used strong.

Other methods that are frequently advocated include deep ploughing in autumn and collection of the larvae behind the plough. In extreme cases white mustard can be used as an alternative crop.

MULLOT (G.). **Traitement de la Cochylis et de l'Eudémis, au Château de Pech, en 1921.**—*Progrès Agric. & Vitic., Montpellier,* lxxvi, no. 35, 28th August 1921, pp. 207-208.

The author, who claims to have had considerable success with remedial measures against the vine moths, *Clysia ambiguella* and *Polychrosis botrana,* records the exact procedure adopted in his own vineyard in 1921. As the more vigorous vines are more severely attacked, he suggests that it is essential to avoid the use of purely nitrogenous manures, and to replace them with mixed fertilisers containing phosphoric acid, potassium, and only a little nitrogen. Besides other measures, such as hot-water applications, the removal of superfluous leaves, etc., three copious sulphur treatments were given. In one area, failing the necessary time for hot-water treatment, the vines were kept covered with sulphur throughout July, and showed little trace of *C. ambiguella* in mid-August. The author is convinced that sulphur is superior to lime as a remedy against the larvae on the fruit.

SOURSAC (L.). **Les Parasites viticoles et le Pyrèthre.**—*La Vie Agric. & Rur., Paris,* xix, no. 35, 27th August 1921, p. 139, 1 fig.

The known remedies against the vine moths, *Clysia ambiguella* and *Polychrosis botrana,* are briefly reviewed, and it is pointed out that it is most important to apply these at the right moment and with the greatest thoroughness. The value of pyrethrum in this connection is discussed, and the desirability of obtaining this product fresh and pure is emphasised. The usual method has been to buy it at a high figure, and frequently in an adulterated or stale condition, but it is quite easy to cultivate. It should be sown in a nursery in March or August, and lightly covered with fine earth. When planting out in spring for the August seedlings, or in September for the March ones, it is unnecessary to replace any other crop, as the pyrethrum can conveniently be planted at intervals of about 20 inches, at the borders of fields or in vineyards, where it will be a good substitute for self-sown weeds.

WESTER (P. J.). **The Mango.**—*Philippine Bur. Agric., Manila,* Bull. 18, 2nd revd. edn., 1920, 70 pp., 17 plates, 9 figs. [Received 31st August 1921.]

This bulletin dealing with the cultivation and uses of the mango closes with an account of the insects injurious to the plant in various parts of the world, with a list of the remedies advocated for their destruction.

The principal and, as far as is known at present, the only serious pests of the mango in the Philippines are: two unidentified Lepidoptera; the leafhoppers, *Idiocerus clypealis,* Leth., and *I. niveosparsus,* Leth.; the Longicorn, *Euclea capito,* Pasc.; and the fruit fly, *Dacus* (*Chaetodacus*) *ferrugineus,* F.

La Plaga de la Langosta. [The Locust Pest.]—*Rev. Inst. Agríc. Catalán S. Isidro, Barcelona,* lxx, no. 7, July, 1921, pp. 143–144.

The spread of locusts in the province of Huesca, in a zone close to the border of Catalonia, has caused the Catalonian authorities to make preparations for checking an outbreak. An appeal is made to all concerned to furnish all information that may assist in this campaign.

NOTICES.

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SERIES A: AGRICULTURAL.

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HEGH (E.). **Les Termites.**—*Bull. Agric. Congo Belge, Brussels,* xi, no. 3–4, September–December 1920, pp. 253–352, 65 figs., and xii, no. 2, June 1921, pp. 353–441, 45 figs.

These papers form the first two instalments of a monograph on the termites of Tropical Africa, written with the object of making known the methods of destroying them or preventing the damage due to them. The present chapters contain a description of the principal morphological and anatomical characters of these insects, and review their geographical distribution and classification. The constitution of the population of a termitarium is studied, and its biology and social life are discussed. The food and fungus gardens of certain species are described, and the construction of the nests explained. Later instalments will deal with the relations of termites to other insects and to vegetation, their natural enemies, parasites, etc. The termites occurring in the Congo will be dealt with in one section, and the last instalment will discuss methods of extermination and prevention of damage. It is intended to include a complete list of African termites, with notes on each.

BAKER (A. C.). **The Practical Significance of the Revolution of the Embryo in Aphid Eggs.**—*Science, Lancaster, Pa.,* liv, no. 1389, 12th August 1921, pp. 133–135.

All Aphid eggs, no matter whether laid early or late, reach the resting stage before wintering, and the embryo, especially of *Aphis pomi,* De G., and *A. sorbi,* Kalt. (*malifoliae,* Fitch) remains in this condition until early spring, when normal growth is resumed. This takes place, in the vicinity of Washington, about the middle of March, and is accompanied by the rupture of the envelopes and the revolving of the embryo. An increase of temperature before revolution is fatal to the embryo, whereas after revolution the eggs are more susceptible to contact and similar injury. After revolution of the embryo, hatching may be advanced or retarded by weather conditions; and high temperatures, which before revolution would have proved fatal, only serve to hasten hatching unless the atmosphere is extremely dry. After revolution the embryo is less protected by reason of the fracture of the gelatinous matrix enclosing it, and as it is actively growing, it is more susceptible to the effect of spray solutions. This may explain the different results obtained in various spraying experiments.

A. prunifoliae hatches in much the same manner, but much earlier than *A. pomi* and *A. sorbi.* The result is that whilst the latter are in the critical period of embryonic development, and may be controlled by a lime-sulphur spray, *A. prunifoliae* is in the first or rarely the second instar, and may be easily killed by a nicotine spray. A combined lime-sulphur-nicotine spray applied as a delayed dormant treatment is therefore advocated for the control of these Aphids.

FROGGATT (W. W.). **Fumigating Maize with Carbon Dioxide.**—*Agric. Gaz. N.S.W., Sydney,* xxxii, pt. 7, July 1921, p. 472.

To protect shelled maize from weevils with carbon dioxide gas, it should be placed in a tank and the gas introduced from a cylinder at the rate of 1 lb. in three minutes for every 12 bushels of grain; a 500 gal. tank holds 60 bushels and should be treated with 5 lb. of

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gas. The gas can be measured by placing the cylinder on a weighing machine. The lid of the tank can be left off, but should be fitted with a rubber ring and replaced when sufficient gas has been admitted. Any weevils present will die within seven days. Maize can be kept in the fumes of this gas for over a year without being affected for seed or food or becoming reinfested with weevils. The gas is harmless and only costs 6*d*. per lb.

MACKENZIE (J. M. D.). **Some Notes on Forest Insect Pests in Burma.** —*Ind. Forester, Allahabad,* xlvii, no. 8, August 1921, pp. 309–317.

For many successive years serious defoliation of teak plantations has occurred and is usually due to the moths, *Hyblaea puera* and *Pyrausta machaeralis*. The attack begins when the leaves appear, and by the end of June whole plantations are leafless ; at the end of August a fresh crop of leaves appears. The growing season of teak is from June to January. Late attacks of longer duration cause more damage than the earlier ones, as they kill the leading shoots. The teak bee-hole borer (*Duomitus ceramicus*), which has ruined some plantations, is a more widely known pest.

Figures are given showing the annual financial loss caused by defoliation ; a fair estimate for existing plantations is probably £15,000 a year ; useful information is also given on the making of plantations. The introduction of pure stands has favoured the increase of insects, while the removal of hollow trees and of scrub destroys the nesting sites of such natural enemies as bats, lizards and birds. These should be encouraged, especially the last-named, which are feeding their young when hatching and dispersion of the larvae are taking place.

DUTT (H. L.). **Report on the Administration of the Entomological Section for 1918–19.**—*Rept. Agric. Dept., Bihar and Orissa, 1918–19, Patna,* 1919, p. 14. [Received 3rd September 1921.]

During the year under review, attempts were made to control *Agrotis ypsilon* by means of a parasite (*Microgaster* sp.). It was hoped to breed this Braconid under artificial conditions, and to infest the first brood of the moth with it in September. The aestivating parasites are usually dormant through the summer, but under artificial conditions of temperature and moisture they emerged as adults in May and died without multiplying owing to excessive heat and drought and the absence of broods of the host.

The eradication of the weed, *Cleome chelidonii*, had no effect on the incidence of attack by *A. ypsilon*.

DUTT (H. L.). **Report on the Administration of the Entomological Section for 1919–20.**—*Rept. Agric. Dept., Bihar and Orissa, 1919–20, Patna,* 1920, p. 13. [Received 3rd September 1921.]

The work on the parasite [*Microgaster*] of *Agrotis ypsilon* was continued during the year with a view to breeding it on its host during the summer and rains and inducing dormancy in the pupating parasites by modifying humidity, so that adults should emerge in the autumn on exposure to humid and cool conditions. The limiting temperature for effective rearing of both parasite and host is 83° F. Fresh parasite cocoons have been stored under similar temperature conditions and

different degrees of humidity. They will be exposed in October to moist conditions, when the effect of the differential treatment as regards moisture will be evident.

After an interval of four years, a campaign was conducted against this pest at Mokameh with Andres-Maire traps [*R. A.E* .,A, i, 507; iii, 320, etc.].

Honda (H.). **Spermatogenesis of Aphids, the Fate of the smaller secondary Spermatocyte.**—*Biol. Bull. Marine Biol. Lab. Woods Hole, Mass., Lancaster, Pa.*, xl, no. 6, June 1921, pp. 349–368, 4 plates.

The contents of this paper are indicated by its title.

Headlee (T. J.). **Report of the Department of Entomology, 1917–18.**—*Rept. New Jersey Agric. Expt. Sta., 1917–18, New Brunswick, N. J.*, 1919, pp. 203–243, 6 tables. [Received 6th September 1921.]

Aphids were very abundant in orchards and on vegetables during the year under review, as the weather conditions were unsuitable for parasites. Potatoes and tomatos were considerably damaged by the flea-beetles, *Epitrix cucumeris*, Harr., and *E. fuscula*, Cr. Some injury can be prevented by thorough applications of Bordeaux mixture, also by maintained applications of lead arsenate and sulphur dust, 1 : 5.

Investigations have been begun on *Cydia* (*Laspeyresia*) *molesta* (Oriental peach moth), which is spreading and may cause serious damage.

Experiments were carried out on the horse-radish flea-beetle (*Phyllotreta armoraciae*, F.), which emerges in the spring and consumes the young shoots. Many were killed by scattering the fields with sliced pieces of horse-radish root treated with Paris green and suspended in water. The growing tips were coated with sulphur, with lead arsenate and sulphur (1 : 5), and with hydrated lime, the last two being the more effective.

The measures recommended for the pear psylla (*Psylla pyricola*) in 1916, and their result in 1917, have already been noticed [*R. A.E.*, A, v, 321; viii, 44]. The three treatments used in 1916 are all important, and if the pest is serious, none should be omitted. Scraping is the least important. Reasonable control may be obtained by regular annual winter and spring spraying with sufficient scraping to keep the trees clean. A thorough coating of spray at the proper time of application is essential.

The failure to control the plum curculio (*Conotrachelus nenuphar*) in 1917 resulted in amending the spray schedule as follows. The first spray should be applied before the buds swell. If Aphid eggs are present on the trees, the treatment should be delayed until the buds show green. The second spray should be applied when the blossoms first show colour; the third directly after the petals fall; the fourth seven days after the petals fall and repeated 17 days later; the last spray between 20th–30th June for all autumn and winter varieties of plums. Thorough applications, keeping the fruit and foliage well coated, are essential. Better results are obtained with a mixture of lime-sulphur and lead arsenate than with the latter alone.

PETERSON (A.). **Eggs of Apple Aphides.**—*Rept. New Jersey Agric. Expt. Sta., 1917–18, New Brunswick, N.J.*, 1919, pp. 231–234. [Received 6th September 1921.]

The bulk of the information given in these studies of the morphology of eggs of *Siphonaphis padi*, F. (*Aphis avenae*, F.), *A. pomi*, De G., and *A. sorbi*, Kalt., together with the various sprays tested, have already been noticed [*R.A.E.*, A, vi, 110; viii, 30, 458].

PETERSON (A.). **Peach Tree Borer.**—*Rept. New Jersey Agric. Expt. Sta., 1917–18, New Brunswick, N.J.*, 1919, pp. 234–243, 2 tables. [Received 6th September 1921.]

The habits of the adult peach-tree borer, *Aegeria* (*Sanninoidea*) *exitiosa*, Say, and the spraying experiments carried out in 1917 have already been noticed [*R.A.E.*, A, viii, 45]. In addition tarred paper collars were extensively used. In borings after this treatment large numbers of larvae of varying sizes were removed. In the autumn, larvae hatched from eggs deposited in the same summer are too small to be readily seen. This is also true in the spring of the next year. In the early part of the year the full-grown larvae that are found have come from eggs deposited late in the summer two years previously. The prolonged development of some of the larvae and the difficulty of removing them all by boring makes it impossible to determine definitely the value of these protectors in one year.

The protectors and their application to the trees are described, with the results of various experiments. From these, 76–90 per cent. of the larvae per tree were reduced in all cases. Many of the larvae were almost full-grown, and were undoubtedly present when the protectors were applied.

Sprays of nicotine resinate, scalecide and other insecticides were applied at intervals of ten days to two weeks. In all cases the trees were uninjured, but the number of larvae was not materially reduced.

HEADLEE (T. J.). **Report of the Department of Entomology, 1918–19.**—*Rept. New Jersey Agric. Expt. Sta., 1918–19, New Brunswick, N.J.*, 1920, pp. 375–459, 13 tables, 1 plate, 5 figs. [Received 6th September 1921.]

A spray for the apple aphis [*Aphis pomi*] that was found efficient, though it did not effect complete control, consisted of 1 part 40 per cent. nicotine to 500 of winter strength commercial lime-sulphur, the latter consisting of 1 gal. standard liquid lime-sulphur concentrate to 9 gals. water. The spray was applied after the buds became silvery and before the small leaves projected. The failure to effect control was partly due to the fact that the lower surfaces of the leaves were not covered with the spray. Other Aphids were abundant on melon, cabbage, cauliflower and spinach, and *Macrosiphum solanifolii*, Ashm., caused considerable damage to potatoes. Against them spraying with 1 part 40 per cent. nicotine to 500 of water is advised, 2 lb. soap being added to each 50 U.S. gals. of water when soft, and 4 to 5 lb. when hard. Pressure is most important, as the Aphids have to be killed by contact.

The codling moth (*Cydia pomonella*) has largely increased during recent years. The fruit should be sprayed from above and below and kept coated, especially in the first week in July, to prevent the larvae of the first brood from entering the sides of the apple. In 1918 the second brood appeared on the late fruit, which should be kept coated during this period, the exact limits of which are under investigation. A brood

study was undertaken and is here described. Orchards that have not been sprayed for many years can only be protected by maintaining the coating of poison on the fruit and foliage from the time the blossoms fall until early in July.

Unusual pests of the year included the Hessian fly [*Mayetiola destructor*] and joint-worm [*Harmolita tritici*], which considerably damaged wheat, and *Hadena fractilinea*, Grote (lined corn borer), which infested maize on land ploughed from grass late in the spring. The larva of this moth bores into the young stalks and destroys the growing shoots. In an old weed field, ploughed late in the season and planted with maize, an unidentified webworm destroyed the planting. Against pear psylla [*Psylla pyricola*] it is recommended, on further investigation, that the whole tree should be sprayed at one time from above and below with the dormant season treatment at winter strength. This treatment should be started in the autumn, before the adults migrate into the bark, and completed in the spring. The San José scale [*Aspidiotus perniciosus*] is also checked by this spray. Spraying with winter strength lime-sulphur (1 : 9) above and below as the buds begin to open destroys the eggs and damages neither fruit nor foliage. Summer strength lime-sulphur (1 : 40) destroys the immature forms covered with honey-dew. This spray scorches both fruit and foliage, but successful experiments were carried out with self-boiled lime-sulphur, which requires more thorough application.

Further experiments on the horse-radish flea-beetle [*Phyllotreta armoraciae*, F.] were carried out with equal parts of powdered lead arsenate and sulphur; Bordeaux mixture 5 : 5 : 50; Bordeaux mixture 5 : 5 : 50 and 1½ lb. powdered lead arsenate; lead arsenate alone, 1½ lb. to 50 U.S. gals. water; and Bordeaux mixture 5 : 5 : 50 plus 1 lb. Paris green to each 60 U.S. gals. The dusting with lead arsenate and sulphur was the most effective, but lead arsenate alone was ineffective. Bordeaux mixture in all forms stunted growth.

Experiments against the onion maggot [*Hylemyia antiqua*] are described. Baits were set as the flies began emerging early in April before the young onions showed above the ground. Clam shells proved the best carriers of the bait, which consisted of 2 U.S. quarts molasses to 1 U.S. gal. water in which 1 oz. of sodium arsenite had been dissolved. The baits should not be placed further apart than the corners of fifty-foot squares.

A more extensive study was made of the lima bean maggot (*Phorbia fusciceps*) than had been undertaken in 1917 [*R.A.E.*, A, viii, 44]. It was proved that the soil was infested either with the eggs or the larvae or both when the beans were planted. The results of seed treatment show that the damage can be reduced without interfering with germination.

Experiments with various chemicals to determine the effect of atmospheric moisture on the rate of development of the bean weevil [*Bruchus obtectus*] were made, but not completed.

PETERSON (A.). **Response of the Larvae of the Peach Tree Borer** (*Sanninoidea exitiosa*, **Say**) **to various Measures for Control, and additional Notes.**—*Rept. New Jersey Agric. Expt. Sta., 1918–19, New Brunswick, N.J.*, 1920, pp. 402–419, 4 tables, 1 plate. [Received 6th September 1921.]

Some additional notes are given on the adults and eggs of the peach-tree borer, *Aegeria* (*Sanninoidea*) *exitiosa*, Say, special attention

having been devoted to the response of the larvae to various remedial measures.

Further experiments were made with tarred paper collars, which are fully described, as are various substances that were coated on the trunks to kill the larvae—paraffin, tree tanglefoot and gipsy moth banding material being used. Before application all larvae were removed from the tree, and the bark thoroughly cleaned and allowed to dry. The last two did not insure complete control and may injure the tree.

Peterson (A.). **Response of the Eggs of** *Aphis avenae,* **Fab., and** *Aphis pomi,* **De G., to Concentrated Liquid Lime-sulphur, Substitutes for Lime-sulphur and other Sprays, 1918-1919.**—*Rept. New Jersey Agric. Expt. Sta., 1918–19, New Brunswick, N.J.*, 1920, pp. 420–427, 5 figs. [Received 6th September 1921.]

During 1918–19 the eggs of *Siphonaphis padi* (*Aphis avenae*) and *A. pomi* were exceedingly abundant. Experiments were carried out with concentrated liquid lime-sulphur, dry lime-sulphur, barium-sulphur, sodium-sulphur, hydrated lime, miscible oil, nicotine, fish-oil soap (paste), crude carbolic acid, and linseed and cotton-seed oil, and the results are tabulated [*cf. R.A.E.*, A, viii, 31]. The first of these is the most effective, and it is thought that it would be still more so if some substance could be added to reduce its high surface tension to that of a soap solution.

Peterson (A.). **Some Notes on the Spreading Quality of various Contact Sprays.**—*Rept. New Jersey Agric. Expt. Sta., 1918–19, New Brunswick, N.J.*, 1920, pp. 428–433, 2 tables. [Received 6th September 1921.]

Tests to determine the spreading qualities of various contact sprays against Aphid eggs showed that concentrated lime-sulphur (1 : 9) with nicotine (1 : 500) is the most effective spray, but if its spreading quality could equal that of 2 lb. soap solution to 50 U.S. gals. water, it would be far more effective.

Casein-lime added to concentrated lime-sulphur, 1 : 9 or 1 : 6, increases the efficiency of the spray and is made by thoroughly mixing together 25 gm. of finely divided casein (lactic) and 25 gm. of lime. No products have, however, been found that lower the surface tension and yet are practicable for orchard spraying. Soap added to miscible oil increases the spreading quality but not the killing efficiency, while soap added to sodium sulpho-carbonate does not increase its efficiency, and the addition of fish-oil soap decreases it. A solution made by boiling 25 gm. of dry sage-tea leaves (*Artemisia tridentata*) for 1 hour in 500 cc. water, then filtering and testing, showed a reduction in the surface tension when compared with water, and is better than casein-lime, 1 gm. to 100 cc.

Tests proved that the lowest surface tension for all soaps is obtained between 1 gm. to 400 cc. and 1 gm. to 100 cc. For all soaps tested, the lowest surface tension occurs at the rate of 1 gm. to 200 cc. (2 lb. to 50 U.S. gals.).

Beckwith (C. S.). **Cranberry Investigations.**—*Rept. New Jersey Agric. Expt. Sta., 1918–19, New Brunswick, N.J.*, 1920, pp. 447–459, 7 tables. [Received 6th September 1921.]

The cranberry girdler [*Crambus hortuellus*] is the most serious pest attacking cranberries. The remedial measures are flooding

by holding the winter flood until the 20th July and losing the year's crop; harvesting the crop early and flooding the bog at the end of September; or sanding, which covers the injured runners and may kill the moth before it pupates. Further investigations were made with local treatments of sodium cyanide in weak solution directly on infested spots. No living larvae were found on plots receiving $\frac{3}{4}$ oz. sodium cyanide diluted in $18\frac{3}{4}$ U.S. gals. water or stronger. The effect of this solution on the cranberry plant was tested, and the same treatments, repeated in the autumn, showed in the spring that the vines on the treated plots were even more vigorous than the untreated portions.

HOFFMANN (A.). **Remarque sur quelques Insectes destructeurs de nos Légumes cultivés.**—*Misc. Ent., Uzès,* xxv, no. 10, July–August 1921, pp. 73–74.

The extreme dryness of the season 1921 intensified the normal damage to vegetable crops by certain pests. For flea-beetles that attack the leaves of turnips, cabbages, radishes, etc., the author has had considerable success with sprays of 2 lb. soft soap in 10 gals. of water, with $\frac{1}{2}$ gal. 12° nicotine, the spray being applied in the evening. Damage to the roots of cabbages was caused in part by the larvae of a Dipteron, which could not be reared, as practically all the pupae were parasitised by a Hymenopteron. Other larvae infesting the roots were those of the beetles, *Baris laticollis,* Marsh., *B. chlorizans,* Germ., and *B. cuprirostris,* F., the last named being comparatively scarce. Adults were also found in the galleries, proving that these beetles do not pupate in the ground as was previously supposed. The larvae devour the rootlets and penetrate the stem, in which they make short and fairly straight galleries. Before pupating, the larva closes the gallery with masses of excrement, with which it also forms a cocoon; this does not always occur in the case of *B. laticollis.* The Cruciferous food-plants of these beetles include *Diplotaxis tenuifolia, Roripa nasturtioides,* etc. *Reseda lutea* is also a food-plant of *B. chlorizans* and *B. cuprirostris.*

A spray consisting of 1 lb. iron sulphate to 10 gals. water has proved a successful remedy, and should be applied twice at a fortnight's interval, followed, if possible, by cultivation of the ground. This treatment is even better as a preventive. Care should be taken not to spray the heart of the plant.

KUFFERATH (H.). **Microbe pathogène pour les Sauterelles et d'autres Insectes,** *Micrococcus* (*Staphylococcus*) *acridicida,* **Kuff., nov. spec.**—*Ann. Gembloux, Brussels,* xxvii, no. 8, August 1921, pp. 253–257.

In 1913, locusts were received from Greece, where they had formed part of a disastrous invasion. They were obviously infected with a spontaneous disease, which was found to be caused by various species of *Staphylococcus,* the one that proved most important being *S. acridicida,* sp. n., which is closely allied to *S. pyogenes.* The preparation, culture and appearance of this organism are described. Locusts inoculated between the second and third abdominal segments with an emulsion of the micro-organism, and others fed on leaves sprayed with the emulsion, died within 48 hours. This *Staphylococcus* is apparently directly pathogenic to the insects and does not require a series of passages from insect to insect as does d'Herelle's *Coccobacillus* [*acridiorum*]. Its effect was also tried on larvae of *Pieris rapae,* L., in Belgium,

and of nine infected by the mouth or fed twice on infected leaves six died. An individual of *Locusta viridissima*, L., inoculated in the third abdominal segment, died in eight days, and the *Staphylococcus* was recovered from it. Further experiment is advisable with a view to determining the value of this micro-organism against locusts and other insects.

MILES (H. W.). **The Raspberry Gall Fly** (*Lasioptera rubi*, **Schrk.**).—*Jl. Minist. Agric., London*, xxviii, no. 6, September 1921, pp. 548–550, 1 fig.

The Cecidomyiid, *Lasioptera rubi*, Schrk., causes galls on raspberry and blackberry canes, both in hedges and in plantations; it is becoming increasingly injurious in Kent, and is also reported from Somerset. The galls become noticeable after the leaves have fallen, and when opened are found to contain 15–30 larvae of an orange-red colour. The various stages are described. Oviposition occurs in June, the eggs being laid at the base of the buds and side shoots. The larvae, appearing about eight days later, burrow into the rind and feed, setting up the irritation that results in the formation of galls. The effect of infestation is a stunting of the canes, which may bear no fruit and few leaves.

A simple remedy is to search the plantations during autumn and early winter and cut off all affected canes below the gall, burning the prunings. Blackberry bushes or hedges near the plantations should be similarly cut back, or, if they are the source of the infestation, they should be destroyed by burning.

LLOYD (Ll.). **Cleaning Glasshouses against Red Spider.**—*Circ. Lea Valley & Dist. Nurs. & Growers' Assoc., Cheshunt*, ii, no. 1, September 1921, 4 pp.

The chief difficulty in dealing with the red spider (*Tetranychus telarius*) on cucumbers lies in the destruction of the red forms in winter. The various positions and crevices in which the mites may be found inside and outside greenhouses are described. Fumigation with sulphur is ineffective when the mites are in hiding; painting the houses is useful, but does not exterminate them. They can be largely prevented from invading the houses in summer if weeds on the nursery are kept down and hedges kept clean.

A spray that has been tested with satisfactory results consists of an emulsion of cresylic acid and soft soap. To prepare this emulsion a loose brick furnace with an iron grid should be built; the wall above the grid should nearly reach the rim of a bucket on the latter; 1 gal. of 97–99 per cent. cresylic acid ("pale straw") to 8 lb. pure potash soft soap should be heated in the bucket for 10 minutes over a brisk fire of wood or coke, until the soap has completely melted. This makes 2 gals. of a strong emulsion sufficient for 100 gals. spray, at a cost of about 6s. 6d., and one man can prepare in a day sufficient to spray some 2,000–3,000 ft. of cucumber house. The strong emulsion is used at the rate of 1 part in 50 parts water, or 2 pints in 12 gals. Operators should wear goggles, as the fluid affects the eyes.

The whole house, plants and surface of the ground should be drenched. During spraying all ventilators should be opened, and closed again when the operation is finished, as the vapour produced has a beneficial effect. All cracks should be carefully sprayed. After treating the

outside, the house should be closed for four days, then cleared out and the ventilators and doors left open. Houses treated in this way may be replanted after a fortnight. Canes from infested houses should be dipped in bundles for two minutes in boiling water to kill all mites in them. Out of doors, *Convolvulus*, which commonly grows amongst staging stacked in the open, is the favourite food-plant of these mites. In winter they hide in the crevices of the staging, and are thus taken into the houses the following season. When possible, staging should be washed with the spray fluid and removed to where it is free from weeds. To prevent pots becoming infested in the same way, they may be dipped in boiling water.

The varieties of tomatos most liable to attack by this pest are recorded. " Comet " and " Blaby " are the most resistant, and the plants should be left unstopped until well on in the summer.

Departmental Activities: Entomology.—*Jl. Dept. Agric. Union S. Africa, Pretoria*, iii, no. 2, August 1921, pp. 108–112.

An observation is recorded of honey-bees carrying off the wax produced by the wax scale, *Ceroplastes zonatus*, on silver wattle. Many species of Coccinellids occur in South Africa, but few are of much economic importance. *Chilocorus distigma* is a conspicuous one, but it has so many enemies that it only occasionally increases to any extent. The fruit moth, *Achaea lienardi*, was recorded in large numbers on a fig tree (*Ficus natalensis*), but disappeared in a few days, and no larvae were found.

It is suggested that the old remedy of drawing a chalk line around furniture, etc., to keep off ants deserves to be better known. Its limitations are obvious, but its application is very simple. The ants cannot cross a chalk line on an inverted, vertical or very sloping surface, as the loose particles give way and they drop to the ground. This applies to the house ant, *Pheidole punctulata*, and to the larger ants, such as *Plagiolepis custodiens*, thrips, Coccinellids, small spiders, etc. On trees with smooth bark a band either of soft chalk or charcoal is efficacious, if the ant trail is not too strong.

Cotton suffered considerably from bollworms, the most important species being *Heliothis* (*Chloridea*) *obsoleta*, particularly in cotton fields near old maize lands, and the Sudan bollworm [*Diparopsis castanea*] in other localities. For both moths, thorough preparation of land and frequent shallow cultivations have proved the most practical remedy, the bollworms being destroyed in the soil before reaching the adult stage. The Jassid, *Chlorita facialis*, breeds in the veld and migrates to the cotton fields, where it seems to increase more rapidly ; in cases of severe infestation the leaves wither and drop, the formation of bolls ceases, and the plants sometimes die, though plants that have been manured maintain their vigour and are able to resist attack. The cotton-stainers, *Dysdercus* and *Oxycarenus* spp., are minor pests ; much can be done to eliminate damage from staining by careful picking and the sunning of seed-cotton before packing. The best results are obtained by exposing the cotton in thin layers on sheets of iron laid upon the bare ground.

Citrus trees were badly injured in one locality by termites, perfectly healthy trees being sometimes completely ring-barked in 24 hours. Individuals of the fungus-growing species of *Macrotermes* were taken at work on a young orange tree. Purchasers of sodium fluoride for use against cockroaches are cautioned against an adulterated form that

is being offered, mixed with as much as 60 per cent. common salt. This may be distinguished from the genuine article by being coarser and becoming moist in humid weather. Pernicious scale [*Aspidiotus perniciosus*] is spreading in some localities in spite of extensive spraying. A scale has been found on the wild fig tree, *Ficus pretoriensis* (?), near Pretoria, that is closely allied to *Chrysomphalus ficus* (circular purple scale) and to *C. dictyospermi* (Spanish red scale), and is at present provisionally regarded as a form of the latter.

The location of the latest locust swarms is discussed, considerable damage having been done to cereals in some districts. Small locust birds have reduced the numbers considerably, and great numbers have died, apparently as the result of parasitism by a fly.

Fuller (C.). **White Ant Notes.**—*Jl. Dept. Agric. Union S. Africa, Pretoria,* iii, no. 2, August 1921, pp. 142–147.

A study has been made of the degree of resistance shown by various kinds of wood to the attacks of termites. In South Africa practically no wood is eaten except by termites invading it from the ground. It is apparently only possible for an attack upon insulated wood to take place along a narrow strip of the eastern coast, as it is only there that termites are capable of founding colonies in wood not in connection with the soil. The various factors influencing termite attack, such as locality, state of decay of the timber, humidity or aridity, position of the wood in the ground (the covered part frequently decaying and becoming attacked, while the exposed part escapes because it becomes seasoned), the natural or acquired hardness of wood, etc., are discussed.

In 1906 a series of experiments was undertaken to test the relative immunity or susceptibility of a variety of timbers when placed in the ground. The results showed that the timbers commonly imported from America and Europe, such as mahogany, hickory, poplar, beech, oak and ash, were entirely destroyed within two years. Of 24 native timbers tried, only four escaped attack, viz.:—*Combretum porphyrolepsis, Adina galpini, Olea laurifolia,* and *Brachylaena discolor.*

As knowledge regarding the particular species of termites involved was very vague, and their biology undetermined in this test, a more extensive one was undertaken in 1920, with 23 native and 12 exotic timbers. This will require some years for completion; meantime a table shows the scientific and local name of the timbers used and their condition after a first examination. The termites found were *Macrotermes natalensis, Microtermes* sp., *Termes latericius* and *Eutermes* sp.

Dupont (P. R.). **Entomological and Mycological Notes.**—*Seychelles: Ann. Rept. Agric. & Crown Lands, 1920, Victoria,* 1921, pp. 6–7. [Received 7th September 1921.]

The following insects have recently been recorded for the first time in Seychelles. The Coccid, *Pulvinaria floccifera,* West., occurs on *Lantana, Chionaspis subcorticalis,* Green, on palms, and *Aspidiotus cyanophylli,* Sign., and *Eucalymnatus* (*Lecanium*) *tessellatus* var. *perforatus,* Newst., on leaves of guava and soursop. The ant, *Odontomachus haematoda,* is credited locally with driving away the ubiquitous *Technomyrmex albipes*; this has not been proved, but the species is known elsewhere to be beneficial in view of its habit

of raiding termites. The Tortricid, *Argyroploce aprobola*, Meyr., attacks the leaves of *Hibiscus abelmoschus* and occasionally cinnamon. As the former is no longer grown in the colony, it is hoped that the infestation will not spread.

Illingworth (J. F.). **The Cane Grub.**—*Queensland Agric. Jl., Brisbane,* xvi, no. 1, July 1921, pp. 50–53, 1 fig.

Following upon excessive rains in March and April 1921, the effects of submergence on cane grubs [*Lepidiota*] were studied. After one or two days under water the weaker grubs were dead ; at the end of five days all had succumbed. The effect of flooding was, however, rather disastrous on the canes, causing the terminal shoot to rot, and resulting in a growth of the lateral buds.

Experiments with arsenic showed that placing it at the bottom of the drill with the plants gave no results, even where 200 lb. were used per acre ; this may, however, have been due to excessive moisture forcing the grubs to the surface, so that they fed on the stalks. Arsenic was much more effective if dusted around the young shoots when about 12 inches high, and used at the rate of about 200 lb. per acre. By the time the grubs had reached the second or third stage many of them were destroyed.

Ceromasia sphenophori having been proved an important parasite of *Rhabdocnemis obscura* at Babinda, growers are urged to obtain parasitised material from that place, in the form of short lengths of borer-infested cane. These should be placed between the rows in an infested field, and each stalk should be covered with about 1 inch of finely pulverised soil. This should be done in fields that are to stand for two months or more, so that the flies may escape, reproduce, and spread to other fields before the cane is cut. There should be a continuous supply of standing cane in each locality so that the flies can maintain themselves ; if all cane is cut at once the parasites will die out, as the course of a generation only occupies five weeks. A small area left standing every mile or so is sufficient to maintain them, and such areas can be cut later, after the other fields are bearing again.

Jarvis (E.). **The Mealy or Grey-back Cane-beetle.**—*Queensland Agric. Jl., Brisbane,* xvi, no. 1, July 1921, pp. 46–50, 1 plate.

The metamorphosis and external anatomy of the principal sugar-cane beetle of Queensland, *Lepidoderma* (*Lepidiota*) *albohirtum*, Waterh., are described and illustrated. The eggs are laid in batches in an irregular-shaped chamber at a sufficient depth in the soil to ensure their remaining damp for at least two weeks, the number reaching an average of about 27 eggs per female. The third instar larva is described in order to avoid confusion with that of *Lepidiota frenchi*, Blackb., *L. consobrinus*, Gir., and *L. caudata*, Blackb., all of which, however, are slightly darker and decidedly opaque, besides having different arrangements of the anal patch and surrounding bristles. Pupae are found in the soil at depths varying from 4 to 15 inches, the variations probably being due to several factors, such as temperature, moisture, drainage and the mechanical condition of infested lands. Pupation generally occurs directly under the stools that have been attacked, probably owing to the added moisture of the soil. The pupal chamber is constructed in such a manner as to exclude small insect enemies

and prevent injury from either excessive drought or heavy rains. This enables the adults to remain for several weeks, or even months, in the pupal chamber, waiting for rain to soften the ground sufficiently for them to ascend to the surface.

le Poer Trench (A. D.). **Report on Visit to Guatemala and Costa Rica to investigate Methods of Cultivation of Coffee and its Diseases and Pests.**—*Kenya Colony Dept. Agric., Nairobi,* 1921, 19 pp., 18 figs. [Received 8th September 1921.]

One of the most recent pests in Guatemala is the larva of a moth that feeds on the shade tree *Inga vera*, causing, in some cases, almost complete defoliation. Other pests recorded are scale-insects, against which spraying is occasionally carried out, thrips, cut-worms, a leaf-mining moth, mealy bugs and an Aphid. On the whole little injury is caused to coffee by diseases and pests in Central America, and not much spraying is done to control them.

Blatchley (W. S.) & Leng (C. W.). **Rhynchophora or Weevils of North Eastern America.**—*Indianapolis,* The Nature Publishing Co., 1916, 682 pp., 155 figs. [Received September 1921.]

The geographical scope of this work covers the United States and Canada east of the Mississippi River. Its object is to furnish a manual that will enable the student to classify and identify weevils, and to this end many matters relating to synonymy and other more strictly technical questions have been omitted. Keys to the families, genera, species and other subdivisions form an important part of the work.

Following the description of each species are notes on its distribution, food habits, etc., and in the case of species of economic importance, a summarised life-history is also given, with notes on the damage done.

The volume concludes with a complete bibliography, and a plant and generic index, as well as one covering the new genera and species described.

Ralfs (E. M.). **An Abstract of the Legislation in Force in the British Empire dealing with Plant Pests and Diseases up to the Year 1920.**—*London,* Imp. Bur. Ent., 1921, 65 pp. Price 2*s.* 6*d.*

This summary, which is arranged geographically, contains in a compact form the legislation enforced with regard to plant pests and diseases up to the year 1920, with an index to the pests, plants and places dealt with.

Summary of Laws and Regulations in Force in Ceylon in respect of Plant Pests and Diseases.—*Ceylon Dept. Agric., Peradeniya,* Bull. 48, May 1921, 6 pp. [Received 6th September 1921.]

The legislation in Ceylon summarised in this paper dates from the year 1901. That of recent years has previously been noticed [*R. A. E.*, iv, 484 ; v, 46, 232, 480 ; vi, 87].

Haviland (M. D.). **The Experimental Production of Winged Forms in an Aphid,** *Myzus ribis,* **Linn.**—*Ann. App. Biol., Cambridge,* viii, no. 2, August 1921, pp. 101–104.

Most Aphids are dimorphic in respect of the viviparous parthenogenetic generations, which may be either winged or wingless, but the factors determining the appearance of either form are not yet

understood. Failure of food supply has been suggested as causing the development of a high proportion of winged forms, and the presence of solutions of various salts has been thought to have the same result. Experiments have been recorded in which 100 per cent. of winged forms were produced by watering the food-plants with certain substances such as the salts of magnesium, antimony, nickel, tin, zinc and sugar, while tap-water, alcohol, tannin, urea, salts of strontium, potassium, calcium, etc., are reported to be non-wing producing substances. The Aphids were susceptible to the treatment for three or more days after birth, according to the species.

In 1920, the author, wishing to obtain a number of winged females, experimented with *Myzus ribis* (red currant aphis), placing individuals newly born from stem-mothers on cuttings of red currant watered, some with tap-water and some with magnesium sulphate. The results are shown in a table, where it is seen that the percentage of winged individuals varies from 70 per cent. to 4 per cent. on cuttings watered with magnesium sulphate, and that the largest proportion (90 per cent.) was obtained where nothing but tap-water was used. A further experiment seemed to show that magnesium is not the only determining factor in wing production, although it is quite possible that the Aphids may react to metabolic changes in the food-plant induced by an abundance of such salts in the soil. The proportion of winged females of the pea Aphid, *Acyrthosiphon* (*Macrosiphum*) *pisi destructor*, has been raised by periodically starving the parent during its development, but it is pointed out that periods of total abstinence, alternating with periods of normal feeding, would not necessarily produce the same effect as continuous feeding on an inadequate diet.

It is known that the maximum production of winged forms in many species takes place in the third and fourth generations, when food is abundant, and then diminishes in a marked degree [*R.A.E.*, A, vii, 371]; it is also pointed out that in most species the last individuals of the cycle (the oviparous females) appear just before the leaves fall and are invariably apterous.

It is concluded that the factors controlling the production of winged forms cannot yet be considered as determined, and may prove in part to be cyclical.

CUNLIFFE (N.). **Preliminary Observations on the Habits of** *Oscinella frit*, **Linn.**—*Ann. App. Biol., Cambridge*, viii, no. 2, August 1921, pp. 105–133, 1 fig., 12 tables.

A study of the frit-fly, *Oscinella frit*, L., has been made in Britain in view of the fact that most of the data published in recent years have been of Russian origin. Adults were found to be prevalent in the field throughout the year except from November to April. The prevalence curves indicate that high prevalence is associated with high temperatures, while emergence is dependent on rainfall, and should not be associated with any particular generation. The first generation becomes abundant in the first week in June, and it seems from experimental data obtained in 1919 and 1920 that three, or even four, generations may be produced in a favourable season. The periods between emergence of successive generations are about 50 days in spring, 35 days in summer and 230–250 days in winter. Summer food-plants include *Arrhenatherum avenaceum*, *Festuca pratensis*, *Lolium italicum*, *L. perenne* and *Poa annua*; and in the winter, *Alopecurus myosuroides*, *Arrhenatherum avenaceum*, *Hordeum pratense*, *L. italicum* and

L. perenne. In captivity, the adult lives 50 days in spring and summer, but in the field longevity is probably very variable and entirely dependent on meteorological conditions. Many investigators have recommended ploughing infested fields, but experiments in this direction indicate that ploughing in a badly infested crop would fail to destroy the pest effectively. Subsequent rolling, on heavy land, would probably form a crust sufficiently dense to prevent emergence on a large scale, but this method would not be successful on medium or light land. Nitrogenous manures are not likely to repay the cost of application on average land in England. Hymenopterous parasites have previously been recorded in America [*R. A. E.*, A, viii, 184]; those reared for the first time from *O. frit* in England are an unidentified Proctotrupid; the Braconid, *Chasmodon apterus*, Nees; two Cynipids of the subgenus *Psichaera*, which are of interest because other members of the genus *Eucoila* are known to be parasitic on Diptera; *Aphidius granarius*, Marsh.; the Chalcid, *Dicyclus fuscicornis*, Wlk., and unidentified species of at least two other genera.

Tillyard (R. J.). **The Introduction into New Zealand of** *Aphelinus mali,* **a valuable Parasite of the Woolly Aphis.**—*N.Z. Jl. Agric., Wellington,* xxiii, no. 1, 20th July 1921, pp. 7–19, 5 figs.

Arrangements were made in 1920 to ship from America a parcel of parasitised individuals of the woolly aphis [*Eriosoma lanigerum*] to Wellington, N.Z., with the object of establishing there the parasite *Aphelinus mali*, Hald. The infested apple twigs were collected from widely separated localities, in the hope that a good mixed strain of *A. mali* would result, and on their arrival, on 13th January, they were transferred to a special breeding cage. Great care was taken to eliminate any possible hyperparasites before individuals of *A. mali* were liberated on the trees. The only individuals that survived were three males and two females, which were all placed on one apple tree. At the beginning of May very cold weather set in, and the emergence of *A. mali* ceased. By the end of the summer, however, 142 individuals were found. A graph shows the emergences of this first brood and demonstrates the effect of weather on the dates of appearance. The period of emergence in this case covered 29 days, being notably affected by rain and cloud, and especially by sudden drops in temperature. Males predominated at the beginning and females at the end of the brood.

A short account of the life-history of *A. mali* is given. What its seasonal history in New Zealand may be is not yet known, but it promises to increase sufficiently to stock the whole of New Zealand within two years if the winter mortality is not too heavy and if satisfactory methods of distribution are developed.

Chermes **attacking Spruce and other Conifers.**—*Forestry Comm., London,* Leaflet no. 7, August 1921, 7 pp., 4 figs.

A general account is given of the injury caused by various species of *Chermes* to spruce and other conifers. The species recorded as occurring in England are *Chermes viridis*, Ratz., *C.* (*Cnaphalodes*) *strobilobius*, Kalt., *C.* (*Dreyfusia*) *nüsslini*, Börn., *C.* (*D.*) *piceae*, Börn., *C.* (*Pineus*) *pini*, Börn., and *C.* (*P.*) *strobi*, Htg. The only representative of the spruce-Douglas fir Aphids, *Chermes cooleyi*, Gill., is a West American species, but the gall-forming generation on Sitka spruce is not so far known to occur in Britain.

The remedial measures advocated are fumigation with hydrocyanic acid gas and spraying with nicotine or paraffin emulsions, the formulae for which are: $\frac{3}{4}$ to 1 oz. (fluid measure) nicotine 98 per cent., $\frac{1}{2}$ lb. soft soap and 10 gals. water; 2 pts. paraffin and 1 lb. soft soap to 10 gals. water. Plants should be fumigated immediately before despatch to the planting area. To prevent the development of spring forms of *Chermes*, fumigation should be carried out before 1st April. Spraying is less effective than fumigation in the case of nursery plants. At least three applications should be made at intervals of from a week to ten days, before the end of March. Young plants may be freed from the wintering forms of *Chermes* by dipping in a solution of 1 lb. soft soap to 1 gal. of water in the autumn and early spring.

SCHRÖDER (C.) and others. **Handbuch der Entomologie.**—*Jena*, Gustav Fischer. (Review in *Ent. Mitt., Berlin*, x, no. 5, 1st September 1921, p. 162.)

A further part of this work [*R.A.E.*, A, ix, 109] dealing with the genitalia, flight mechanism, palaeontology and phylogeny of insects has been issued.

TRABUT (—). **Un Echo de la Lutte contre les Sauterelles en Crau.** —*Bull. Agric. Algérie-Tunisie-Maroc, Algiers*, xxvii, no. 7, July 1921, pp. 126–127. [Received 6th September 1921.]

The anti-locust league in Crau in the south of France [*R.A.E.*, A, ix, 137] has been informed that severe damage threatened by locusts in June 1921 was entirely prevented by a poisoned bran bait, the user of which has suggested chopped straw or other suitable material as a substitute for the expensive bran. With reference to this question of substitutes the league officials point out that shells and other refuse of ground-nuts are excellent but of limited application, as it may be difficult to obtain quickly a sufficient supply in an emergency.

COHEN STUART (C. P.). **De Theezaadtuinen van Java en Sumatra.** [The Tea Seed Gardens of Java and Sumatra.]—*Meded. Proefst. Thee, Buitenzorg*, lxxv, 1921, 32 pp., 8 plates. (With a Summary in English.)

The tea-seed fly, *Adrama determinata*, is a dangerous pest in seed gardens [*R.A.E.*, A, iii, 434], and another very serious enemy is a Pentatomid bug, *Poecilocoris hardwicki*, which causes white spots in the cotyledons, involving a large loss of seed [*R.A.E.*, A, viii, 453; ix, 369].

LEDEBOER (F.). **Gelestrepenziekte.** [Mosaic Disease.]—*Meded. Proefst. Java-Suikerindustrie, Soerabaya*, 1921, 2 pp.

In view of Brandes' work on the transmission of sugar-cane mosaic disease by insects [*R.A.E.*, A, viii, 370] experiments have been made at the Cheribon Station. Brandes used *Aphis maidis*, a species common in West Java on maize, sorghum and millet, but very rare on sugar-cane. For this reason other species were used as well as *A. maidis*, and it appears that the green leaf aphis, *A. sacchari*, Zehnt., can carry infection from diseased to healthy plants. *A. sacchari* is quite common on sugar-cane, but not so much so as to be definitely

injurious. It is not conspicuous, as it occurs on the lower surfaces of the leaves and prefers shady situations. It occurs in the hills and is more common in the wet than in the dry season.

Reyne (A.). **Verslag van den Entomoloog.** [Entomologist's Report.] —*Verslag Dept. Landbouw in Suriname, 1920, Paramaribo,* 1921, pp. 20–31.

In the wild cacao area discovered in 1920 [*R. A.E.*, A, ix, 195] the only plantation pests found were a leaf skeletoniser, *Zetesima theobromae,* Busck, and a white scale, *Pseudococcus* sp.

In virgin forests *Coccus* (*Lecanium*) *viridis,* Green, was found on *Carpotrocha,* and was there visited by the same ants, *Cremastogaster,* as in the plantations. The coffee ant, *Dolichoderus bidens,* Latr., occurred on *Psidium* and other plants. The coffee thrips, *Heliothrips haemorrhoidalis,* was found on *Bixa* sp., and the cacao thrips [*Heliothrips rubrocinctus*] on *Psidium polycarpon.*

The experiments in combating the cacao thrips by spraying with milk of lime [*R. A.E.*, A, viii, 440] gave good results in the case of young plants sprayed two or three times. With older plants the results were less satisfactory. In the previous experiments stress was laid on preventive spraying, but in one case such spraying in August and September proved of little use ; the outbreak began in mid-November and reached its climax in December. In this instance one application when the thrips appeared would have been more satisfactory than the two preventive ones.

It has been found that leaves that are well covered with lime remain free from infestation. Kaolin has given good results as a substitute for lime. The solution is a very fluid one, and it remains to be seen if the resultant thin coating on the lower surface of the leaves will afford as much protection as lime. One great drawback of kaolin is the difficulty of distinguishing sprayed from unsprayed plants.

Tests with some samples of carbolineum plantarium showed that an 8 per cent. solution did not kill the green coffee-scale [*Coccus viridis*], but an 8 per cent. solution of a sample of fruit-tree carbolineum killed 90 per cent. of the scales ; it is, however, very expensive.

Other insect pests observed in 1920 were :—*Colaspis* sp. and other leaf-eating beetles on cacao ; *Castnia daedalus,* Cr., on coconuts ; *Aspidiotus destructor,* Sign., on coconut (palms sprayed with 6 per cent. carbolineum were killed, but Coccinellids ultimately mastered the infestation and the coconuts recovered by the end of the year) ; and *Dolichoderus bidens,* Latr., which was effectively checked by carbol emulsion.

Demerara green-heart [*Nectandra rodioei*] is a timber known to be proof against the ship-worm, *Teredo navalis,* L., so that the destruction of sluice gates made of this wood led to an investigation, which showed the trouble to be due to a species since described as *Teredo* (*Neoteredo*) *reynii.* This has also been found in the timber of *Dimorphandra excelsa* in a dismantled bridge.

Zanon (V.). **La** " *Saturnia cynthia* " **divenuta polifaga.** [*S. cynthia* now a polyphagous Species.]—*Riv. Agric., Parma,* xxvi, no. 36, 9th September 1921, pp. 511–512.

Saturnia cynthia, imported into Europe from China and Japan shortly after the introduction of *Ailanthus glandulosa,* until recently has only been noticed on that tree. In October 1920 the author

found it on planes in Italy and later on pears, cherries and prunes at a distance of some miles from plants of *Ailanthus*. Laboratory experiments also show that pears, prunes and planes are suitable food-plants. Adults from cocoons on planes seek out *Ailanthus* for oviposition, but if the second generation does not find enough *Ailanthus*, it attacks other plants, beginning with planes. If the first generation were to develop on fruit trees, the situation would be serious. There is also a danger of the mulberry becoming attacked, and it is necessary to decide whether *S. cynthia* is to be bred for its silk, as was intended at one time, or whether it should be destroyed now in order to avoid serious complications in the future.

The only remedies available are the collection of the cocoons and the destruction of *Ailanthus* trees.

HORVATH (G.). **Description d'un Fulgoride nouveau des Dattiers.**—*Bull. Soc. Hist. Nat. Afr. Nord, Algiers,* xii, no. 7, July 1921, pp. 179–180. [Received 13th September 1921.]

Asarcopus palmarum, gen. et sp. n., is described from Egypt as infesting the crowns of the date palm (*Phoenix dactylifera*). Although occurring in colonies, it does not apparently cause any appreciable damage.

BALLOU (H. A.). **Pink Bollworm in the Leeward Islands.**—*Agric. News, Barbados,* xx, no. 504, 20th August 1921, pp. 266–267.

In May and June a visit was paid to the Leeward Islands, where search was made for the pink bollworm [*Platyedra gossypiella*]. In Antigua the cotton season was over, except in one district; *P. gossypiella* was found there, but the attack was probably of recent origin, as a large crop had already been gathered. In Anguilla, infestation was discovered in April [*R.A.E.*, A, ix, 400], and a plan was adopted for continuing cotton growing with a modified form of close season and for carrying out necessary remedial measures. The methods adopted were the same as those in other Islands [*R.A.E.*, A, ix, 99]. A long close season is not necessary as there are no cotton-stainers in Anguilla, and a close season was fixed for one day, with the proviso that previous to the date fixed all cotton in the fields must be destroyed and after that date might be planted at any time. This would enable advantage to be taken of a rainy period for planting. Larvae in the ginnery were found to be attacked by a predaceous mite that appeared to be *Pediculoides ventricosus*. It is unusual for it to be found early in the season, or at a time when *P. gossypiella* is not abundant. Besides cotton and okra, the garden hollyhock is also a food-plant of the pink bollworm in Anguilla. Most of the cotton is grown by the peasants in small, isolated patches, which will be difficult to locate and deal with. A committee has been appointed to advise the government in St. Kitts as to the proper dates for the close season and for the various measures in the bollworm campaign in Anguilla.

In Nevis there were some 400 tons of cotton seed undisposed of at the time fixed by law for all seed to be either treated for destruction of *P. gossypiella*, or shipped. Most of this was heaped out of doors, where cotton stainers [*Dysdercus* spp.] had access to it. In this instance the time fixed by law was extended for four weeks, and seed that could not be shipped was buried under supervision of cotton inspectors. It was pointed out, however, that this was not a safe method for destroying *P. gossypiella* and that better arrangements for disposal of the seed should be made before another close season.

McSwiney (J.). **Report of the Agricultural Department, Assam, for the year ending 31st March 1921,** *Shillong,* 1921, pp. 7–8. [Received 14th September 1921.]

The pests recorded during the year under review were :—*Hispa armigera* (rice Hispid), *Leptocorisa varicornis* (rice bug), *Schoenobius incertellus* (*bipunctifer*) (rice stem borer) and *Ripersia sacchari* (mealy bug) on rice. An outbreak of the latter was checked by promptly weeding out affected plants. The use of ropes to dislodge army worms and swarming caterpillars and the spreading of a thin film of kerosene oil on the water in the fields proved effective.

Crickets attacking soy beans were destroyed by the use of a termite exterminator. A species of *Apion* destroyed the flowers and seeds of arhar [*Cajanus indicus*]. *Diacrisia obliqua,* attacking various pulse crops and jute, was controlled by systematic hand-picking and by destruction of the egg-masses. A Chrysomelid, *Pagria signata,* caused some damage to leaves of cowpeas. The rape crop was again attacked by the mustard Aphid and a sawfly [*Athalia proxima*]. Against the latter, dusting with sand and ash sprinkled with kerosene [*cf. R.A.E.*, A, vii, 492] proved successful. Other miscellaneous pests were *Agrotis ypsilon* attacking young seedlings, especially of potatoes and tobacco ; mealy-bugs attacking fruit trees ; a beetle on rhubarb ; and Cantharid beetles injuring various crops, including potatoes.

Borden (A. D.). **A Biological Study of the Red Date-palm Scale,** *Phoenicococcus marlatti.*—*Jl. Agric. Res., Washington, D.C.*, xxi, no. 9, 1st August 1921, pp. 659–668, 4 plates.

Practically all the imported palms (over 10,000) in the Coachella Valley, California, are infested with *Phoenicococcus marlatti,* Ckll. Although the quarantine act of 1913 affecting the interstate movement of infested palms has restricted the distribution of this scale outside infested States, dissemination within the attacked area has only been partly retarded. The most important source of distribution is through the offshoots that become infested from the bole of the parent plant. The accidental carriage of scales by man, birds, wind, etc., is of no great importance. Dispersion by natural migration can only take place during the early stages and then only to different parts of the plant, not from palm to palm.

All stages are found at all seasons of the year, the greater number of active larvae occurring from March to December. In early spring, during the migratory period, they mass together on the fronds and fruit clusters, causing serious damage, which may result in the dropping of the fruit and retarded development of the plant. The adult stage is reached in about a month or less, according to the season. Field observations indicate that the life of the scale lasts from six to nine months. The proportion of adult males to adult females is exceedingly small.

The insects usually become buried to a depth of four or five inches under the plant tissues, and are thus well protected from adverse atmospheric conditions and remedial measures. The main infestation on mature palms is in the white living tissues of the leaf bases and fibre bands from $1\frac{1}{2}$ to 3 feet down from the crown or from the fifth to tenth leaf whorl. During the migratory period in April, May and part of June the exposed fruit stems may become infested. Of the root system only the so-called superficial roots have been observed

to be attacked. Some scales may be found on the pinnae of the leaves from two to six feet out from the trunk, but these are usually completely controlled by the heat of summer. The degree of infestation is much heavier on certain varieties of palm, that known as " Horra " being apparently most susceptible to attack.

A predaceous beetle, *Laemophloeus* (*Cryptolestes*) *truncatus*, Casey (?), is found throughout the year and is responsible for the destruction of a large number of the scales. A Dipterous larva, probably a Cecidomyiid, was also found in January among a mass of scale-insects.

It is important to check the migrations of the scale, thus preventing the new tissues and fruit stems from becoming infested. The spray advocated for this purpose consists of one part liquor cresolis compositus, U.S.P., 4 parts oil distillate or kerosene and 50 parts water. It should be applied by a power spray under 200 to 225 pounds pressure, so that it will penetrate deeply between the fibre bands and leaf bases. The palms should be pruned before spraying and, if possible, as many offshoots as are ready should be removed. On old palms the decayed leaf bases and infested superficial roots should also be removed. The best time for application is determined and limited by the time the fruit crop is off, the migratory period of the scale, the blooming period, and the time the fruit begins to make sugar. At least four applications should be made. The most suitable time for imported palms, other than seedlings, is generally from 1st January to 15th February, 15th February to 1st April, 15th May to 30th June, and 1st July to 15th August. Infested offshoots should be submerged in the spray solution for 15 minutes, allowed to drain for 24 hours and submerged again for 15 minutes. They are not injured if left for 24 hours in a solution of 1 to 50.

MORRISON (H.). **Red Date-palm Scale,** *Phoenicococcus marlatti* : **A Technical Description.**—*Jl. Agric. Res., Washington, D.C.*, xxi, no. 9, 1st August 1921, pp. 669–676, 4 plates, 1 fig.

The distribution of *Phoenicococcus marlatti*, Ckll., is reviewed, and descriptions of the various stages of both sexes are given. In every case on record the food-plant of this scale has been some variety of the date palm (*Phoenix dactylifera*), and all the evidence indicates that it is probably confined to this food-plant in nature and that it probably occurs wherever the date palm is cultivated.

SIMMONDS (H. W.). **The Transparent Coconut Scale,** *Aspidiotus destructor*, **and its Enemies in Southern Pacific.**—*Fiji Dept. Agric., Suva*, Bull. 14, 1921, 4 pp. [Received 19th September 1921.]

The information contained in this bulletin concerning *Aspidiotus destructor* has been noticed from another source [*R.A.E.*, A, ix, 501].

HAYES (W. P.). *Strigoderma arboricola*, **Fab.—Its Life-cycle (Scarab. Coleop.).**—*Canad. Ent., Guelph*, liii, no. 6, June 1921, pp. 121–125, 1 plate. [Received 20th September 1921.]

Strigoderma arboricola, F., occurs somewhat generally throughout Kansas, but only at rare intervals is it sufficiently abundant to be of economic importance. Previous records of the food-plants of this beetle are quoted. The blossoms of wild and cultivated roses are

apparently the preferred food in Kansas. The larvae were not observed feeding in nature. In captivity they were reared on bran and wheat kernels, and there is evidently no difference between the feeding habits of this beetle and the more common species of *Lachnosterna*.

The beetles occur from May to July, oviposition taking place in June and July. The eggs hatch in from 10 to 14 days. The larvae hibernate in the soil and reach the pupal stage in about 328 days. Complete development from egg to adult requires about 352 days. An Asilid fly, *Proctacanthus brevipennis*, has been recorded as predaceous on *Strigoderma*.

SCHELLENBERG (A.). **Das Auftreten der Reblaus und die Rekonstruktion der Rebberge im Kanton Aargau.** [The Occurrence of *Phylloxera* and the Reconstruction of the Vineyards in the Canton of Argovie.]—*Schweiz. Zeitschr. Obst- u. Weinbau, Frauenfeld*, xxx, no. 18, 10th September 1921, pp. 277–279.

The Swiss canton of Argovie has been known to be infested since 1905 by *Phylloxera*, and many of the vineyards have been destroyed. Since 1920 a determined effort has been made to resume vine growing with grafted vines, and up to the present the results are said to be satisfactory.

RÖBER (—). **Ein Feind der Blutlaus.** [An Enemy of *Eriosoma lanigerum*.]—*Der Lehrmeister im Garten und Kleintierhof*, 1921, p. 121. (Abstract in *Wiener Landw. Ztg.*, 1921, no. 68–69.)

Attention is drawn to Verhoeff's observation that the larvae of *Chrysopa vulgaris*, which occur chiefly on *Tanacetum vulgare*, are natural enemies of *Eriosoma lanigerum*, so that this plant is worth cultivating in gardens.

SEITNER (M.). **Zwei neue** *Phloeophthorus*-**Arten aus der Herzegowina.** [Two new Species of *Phloeophthorus* from Herzegovina.]—*Zentralbl. gesamte Forstwesen, Vienna*, xlvi, 1920, p. 282. (Abstract in *Wiener Landw. Ztg.*, 1921, no. 68–69.)

Two new species of *Phloeophthorus* do considerable injury in the Karst region of Herzegovina to *Cytisus weldenii*, which is a plant of some economic value, as goats feed on the green leaves in summer and on the twigs in winter. The leaves are also used as a substitute for tobacco.

PETIT (A.). **Pour la Lutte contre le Puceron lanigère.**—*Jl. Soc. Nat. Hortic. France, Paris*, xxii, August 1921, pp. 284–286.

In view of the increase in the price of methylated spirit during the war a formula recommended for its dilution, which is equally efficacious in the control of woolly aphis [*Eriosoma lanigerum*], is five parts of methylated spirit at 90 per cent., two of a 10 per cent. solution of commercial carbonate of soda and five of water. A still cheaper solution may be made by dissolving 9 lb. white soap in 50 gals. water and adding to this 9 gals. methylated spirit at 90 per cent. Owing to the low cost of this mixture, it may be applied with a sprayer instead of a brush.

Rivière (G.). **Le Psylle du Poirier dans la Région Parisienne.**—*Jl. Soc. Nat. Hortic. France, Paris,* xxii, August 1921, p. 286.

An unusual abundance of *Psylla pyri* is recorded from the Paris region, and the necessity for preventing its further spread is emphasised.

Gibson (A.). **Common Garden Insects and their Control.**—*Canada Dept. Agric., Ent. Branch, Ottawa,* Circ. 9, Revised April 1921, 20 pp., 1 fig. [Received 20th September 1921.]

This is a revision of a paper already noticed [*R. A.E.*, A, v, 337].

Criddle (N.) & Mitchener (A. V.). **The Control of Grasshoppers.**—*Canada Dept. Agric., Ent. Branch, Ottawa,* Crop Protection Leaflet 14, March 1921, 4 pp., 2 figs. [Received 20th September 1921.]

Efficient organisation and general co-operation are essential to the success of campaigns for the destruction of grasshoppers. The establishment of mixing centres equipped with the Manitoba poison bait mixer [*R. A.E.*, A, ix, 259] where farmers may secure ready mixed bait would greatly facilitate operations. The grasshoppers to be controlled in the Prairie Provinces are *Melanoplus atlantis* and *Camnula pellucida* [*cf. R. A.E.*, A, viii, 316; ix, 126].

Seamans (H. L.) & Strickland (E. H.). **The Pale Western Cutworm.**—*Canada Dept. Agric., Ent. Branch, Ottawa,* Crop Protection Leaflet 15, June 1921, 3 pp., 3 figs. [Received 20th September 1921.]

A brief outline of the life-history and habits of *Porosagrotis orthogonia* (pale western cutworm) is given, and recommendations are made for combating this moth [*R. A.E.*, A, iv, 346; viii, 192]. Special stress is laid on the importance of cleaning up fields by 31st July and leaving them entirely alone until 15th September. Any weeds that may germinate between these dates will not reach the flowering stage in time to attract the moths, and any light shower will tend to cake the surface of the soil and seal the cracks, thus destroying hiding places for the moths and making the field unattractive for oviposition.

Hopping (R.). **The Control of Bark-beetle Outbreaks in British Columbia.**—*Canada Dept. Agric., Ent. Branch, Ottawa,* Circ. 15, June 1921, 15 pp., 13 figs. [Received 20th September 1921.]

Various bark-beetles cause considerable damage in British Columbia to nearly all coniferous trees, and especially to lodge-pole (*Pinus contorta*) and yellow pine (*P. ponderosa*) in the southern part of the interior. A brief account is given of the damage done by each species, arranged under the trees attacked. Suggestions are also made for controlling outbreaks [*cf. R. A.E.*, A, viii, 489]. The species dealt with are:—*Dendroctonus monticolae*, Hopk. (mountain pine beetle), on yellow pine, lodge-pole pine and western white pine (*P. monticola*); *D. brevicomis*, Lec., on yellow pine; *D. pseudotsugae*, Hopk., on Douglas fir (*Pseudotsuga taxifolia*); *D. obesus*, Mannh., on Sitka spruce (*Picea sitchensis*); *D. borealis*, Hopk. (northern spruce beetle) on Engelmann's spruce (*P. engelmanni*); and *D. valens* (red turpentine beetle) found in the bases of all pines.

TREHERNE (R. C.). **Some Notes on the Fruit Worms of British Columbia.**—Separate from *Scientific Agriculture*, March 1921, 4 pp., 5 figs. [Received 20th September 1921.]

Owing to the great similarity that exists between the various fruit-infesting larvae in Canada, these notes are given as a guide to their ready determination. The species dealt with are the Tortricids, *Eucosma* (*Tmetocera*) *ocellana* (apple bud moth), *Cydia pomonella* (codling moth), *Peronea* (*Acleris*) *maximana*, *Tortrix* (*Archips*) *rosaceana*, *T.* (*A.*) *argyrospila* and *Enarmonia prunivora* (lesser apple worm); the Gracilariid, *Marmara pomonella* (apple fruit miner); the Gelechiids, *Anarsia lineatella* (peach twig borer) and *Aristotelia fragariae* (strawberry crown borer); the Oecophorid, *Epicallima dimidiella*; the Pyralids, *Plodia interpunctella* (Indian meal moth), and *Mineola tricolorella*; and the Geometrid, *Rachela bruceata* (Bruce's measuring worm). A key to certain families, adapted from Fracker, is also given.

CRAWFORD (H. G.). **The European Corn Borer.**—Separate from *Scientific Agriculture*, March 1921, 4 pp., 2 figs. [Received 20th September 1921.]

The present situation with regard to *Pyrausta nubilalis*, Hb., in the United States and Canada is reviewed and general recommendations for protecting non-infested areas and for dealing with those already infested are made.

SKAIFE (S. H.). **Some Factors in the Natural Control of the Wattle Bagworm.**—*S. African Jl. Sci., Johannesburg*, xvii, no. 3–4, July 1921, pp. 291–301, 15 figs.

Very little is known about the early mortality of *Acanthopsyche junodi* (wattle bagworm), although this is one of the most important factors in the natural control of this moth, as a far greater number is destroyed during that period than by the various natural enemies that are present during the later stages. The Ichneumonid, *Philopsyche abdominalis*, Morley, which is a parasite of *A. junodi*, has apparently two generations a year. The adults emerge over a prolonged period from March to October, and the generations overlap. Larvae and pupae were found in the bags of the host in March, and in April eggs and young larvae occur simultaneously.

Carcelia evolans, Wied., is the commonest Tachinid parasite of *A. junodi*. When mature the parasitic larva leaves the body of the host and either pupates in the bag, or drops to the ground and pupates in the soil. Adults emerge from March to October, and there are possibly two generations a year. *C. evolans* is in turn parasitised by a minute Chalcid. About 20 per cent. of the bagworms that survive the early stages are destroyed by insect parasites, of which Hymenoptera are more than three times as efficient as Tachinids.

The action of the fungous disease, *Isaria psychidae*, is somewhat impaired by the attacks of a secondary parasitic fungus, *Melanospora parasitica*. The polyhedral wilt disease of the gipsy moth in America is also highly destructive to *A. junodi*, as are also other diseases of an obscure nature. The virulence of these diseases, however, is largely dependent on climatic conditions. The excessive humidity during the warmer months either sets up physiological disturbances that cause the death of the larvae, or else weakens them and renders them peculiarly liable to disease.

SANDGROUND (J.). **The Economic Value of a Study of the Nematodes, with Remarks on the Life History of** *Heterodera* **in South Africa.**—*S. African Jl. Sci., Bulawayo,* xvii, no. 3–4, July 1921, pp. 322–334.

In this list of Nematodes the following are of importance to agriculture :—*Aphelenchus ormerodis,* on violet buds ; *A. cocophilus,* causing serious injury to coconut palms in the West Indies ; *A. pyri,* causing decay of pears ; *A. fragariae,* destructive to strawberries ; *Tylenchus acutocaudatus,* in coffee trees and causing disease of bananas ; *T. biformis,* infesting the roots of sugar-cane in Hawaii ; *T. dipsaci* (*devastatrix*) (of which *T. scandens* is regarded as a synonym), widely distributed over Europe, Australia and other countries, causing damage to onions, narcissus bulbs and buckwheat, and also producing stem rot of clover and making the cultivation of lucerne almost impossible in many districts in South Africa ; *T. oryzae,* infesting rice in Java, with which *T. angusta,* infesting rice in Bengal, is possibly identical ; *T. mahogani,* causing disease in mahogany trees ; *T. penetrans,* infesting violets, potatoes, cotton and camphor tree roots ; *T. semipenetrans,* infesting roots of *Citrus* in California, Algeria, Australia, etc. ; *T. similis,* in roots of sugar-cane and banana ; *T. sacchari,* the probable cause of a sugar-cane disease ; *T. tritici,* infesting wheat ; *Heterodera schachtii,* attacking sugar-beet and causing galls on maize, barley, rye, oats, winter and spring wheat, and the disease known as nettle-head in hops ; and *H. radicicola,* attacking more than 500 plants of economic importance, including orchard trees and ornamental shrubs, vegetable and cereal crops, tea, coffee, tobacco, cotton, flax, okra, lucerne, rubber, sugar-cane, etc.

The actual financial loss due to the last-named species is incalculable. The peculiarities in its development are discussed, with special reference to sexual differentiation.

GOWDEY (C. C.). **The Citrus Black Fly** (*Aleurocanthus woglumi,* **Ashby**).—*Jamaica Dept. Agric., Kingston,* Ent. Circ. 3, 1921, 11 pp., 2 plates. [Received 22nd September 1921.]

Aleurocanthus woglumi, Ashby, has been recorded on 75 food-plants ; those reported from Jamaica are here classified under the three headings : favourite, occasional, and supplemental food-plants. The eggs are deposited on the lower surface of the leaves in spirals. They hatch in from 7 to 10 days ; the larval stage lasts from 23 to 40 days, and pupation 16 to 48 days, giving a total life-cycle of from 46 to 98 days. The generations overlap, and their number is influenced by climatic conditions.

Natural enemies include *Chrysopa* sp., at least three Coccinellids, and the ant, *Cremastogaster brevispinosa,* Mayr, var. *minutior,* For.

A section of this bulletin by Mr. S. F. Ashby deals with the action of the fungi, *Aschersonia aleurodis* and *Aegerita webberi* [*R.A.E.*, A, viii, 480, etc.]. The cinnamon fungus, *Verticellium heterocladum,* also infests *A. woglumi,* but is of less importance than the others. Co-operation is essential to the success of such remedial measures as spraying. The best results have been obtained with whale-oil soap, kerosene emulsion, or Black-leaf 40, for which formulae are given.

The Black Pine Beetle, *Hylastes ater,* **Payk.**—*Forestry Commiss., London,* Leaflet no. 4, June 1921, pp. 1–4, 3 figs. [Received 22nd September 1921.]

The life-history of *Hylastes ater,* Payk., is briefly described and remedial measures are advocated [*R.A.E.*, A, vi, 116; viii, 379]. These apply also to *H. opacus,* Er.

Gossard (H. A.). **Wheat Insect Survey of 1921: Some Hessian Fly in North-western Ohio; other Pests increasing.**—*Mthly. Bull., Ohio Agric. Expt. Sta., Wooster,* vi, no. 7–8, July–August 1921, pp. 108–110, 2 charts.

During the spring of 1921 the Hessian fly [*Mayetiola destructor*] emerged about a month earlier than usual. The summer infestation, however, did not prove unusually abundant, probably owing to the combined action of late frosts and parasites. The value of ascertaining the best date for sowing is emphasised. Where infestation is below 20 per cent., the date that has given the maximum yield in previous years should be chosen. A map showing these dates for various counties is given.

Chinch bugs [*Blissus leucopterus*] were abundant in north-western Ohio and in restricted localities in the north-eastern area. They are apparently increasing, and a heavy infestation may be expected in 1922 if the summer proves dry. The wheat midge [*Contarinia tritici*] occurred in large numbers in the southern and south-western counties, and is expected to occur again in 1922; but jointworm [*Harmolita tritici*] infestations were very light, amounting to only 1 to 4 per cent. in most counties.

Cimatti (V.). **Il Nemico dei Cavoli.** [An Enemy of Cabbages.]—*Riv. Agric., Parma,* xxvi, no. 37, 16th September 1921, p. 530.

The principal measures against the cabbage butterfly [*Pieris brassicae*] are the collection or crushing of the eggs and caterpillars and the collection of the infested leaves; dusting the leaves with spent lime or quicklime; burning the caterpillars with a flame; spraying with a copper solution as used by vine-growers, with eau de Javelle [sodium hypochlorite], or with a decoction of broom; and the planting of Jerusalem artichokes or hemp in alternate rows with cabbage. Natural control may be promoted by favouring the development of the parasite, *Microgaster* sp.

Cogolludo (J.). **Contribución al Conocimiento de las Zoocecidias de España.** [Contribution to the Knowledge of Plant Malformations of Animal Origin in Spain.]—*Trab. Mus. Nac. Cienc. Nat., Madrid,* Bot. Ser. no. 16, 1st June 1921, 117 pp., 12 figs. [Received 19th September 1921.]

This monograph deals with the various orders of insects causing malformations of plants in Spain and gives a complete bibliography of previous work on the subject. In many cases the locality has been added, as well as descriptions of some species that do not seem to have appeared previously in European literature in this connection.

Gaudicheau (A.). **Une Manière simple et peu couteuse de protéger la Vigne contre les Insectes.**—*Prog. Agric. et Vitic., Montpellier,* lxxvi, no. 38, 18th September 1921, pp. 273–274.

It is stated that a simple method of insuring the destruction of some insect pests of vines is to place small heaps of residue from the wine press at intervals of about four yards throughout the vineyard. The insects are attracted to these heaps for oviposition, and as soon as other food becomes scarce birds readily devour the developing larvae.

Poutiers (R.). *Lonchaea aristella,* **Beck., nuisible au Figuier, nouvelle pour la France.**—*Prog. Agric. et Vitic., Montpellier,* lxxvi, no. 38, 18th September 1921, pp. 285–286.

Lonchaea aristella, Beck., is recorded from figs in the vicinity of Mentone. Oviposition occurs from about May, and apparently numerous generations follow each other from the spring onwards [*R.A.E.*, A, vi, 75]. So far no parasites have been discovered at Mentone. Silvestri's suggestions for the control of this fly are quoted [*loc. cit.*].

Faes (H.). **Les Chenilles grises ou Vers gris.**—*Ann. Agric. Suisse, Lucerne,* xxii, no. 3, 1921, pp. 123–126.

The larvae of *Agrotis, Phytometra* (*Plusia*), and *Mamestra* cause serious damage to various plants in Switzerland, including vines. Their habits are discussed, and previous records of infestations in various countries are reviewed. In some districts hand collection at night is successfully practised, but the use of arsenicals is advocated when dealing with large infested areas.

Faes (H.) & Staehelin (M.). **Sur la Résistance du Hanneton adulte aux basses et hautes Températures.**—*Ann. Agric. Suisse, Lucerne,* xxii, no. 3, 1921, pp. 127–130.

The bulk of the information contained in this paper on the resistance of adult cockchafers [*Melolontha*] to various temperatures has been noticed from another source [*R.A.E.*, A, ix, 419].

de Sanabria (R.). **La Palmera: Sus Productos—Su Cultivo.**—*Bol. Asoc. Agric. Ecuador, Guayaquil,* i, no. 3, May 1921, 6 pp. [Received 23rd September 1921.]

Phoenix dactylifera (date palm), the most important species of palm in Ecuador, is frequently infested by a beetle, *Coccotrypes* (*Bostrychus*) *dactyliperda*, which multiplies very rapidly and does much damage. It lives at first on the inflorescence, and later, when the dates are forming, the female oviposits on the green fruit. After a few weeks the larvae develop and burrow into the fruit, invading the stone, where they feed and complete their transformations. The common palmetto palm [*Sabal palmetto*] is similarly attacked, 10 to 15 larvae sometimes being found in one stone. The best remedy is to gather and burn all infested fruit and stones. It is said that palmettos growing near date palms should be preserved, as the beetles prefer the fruit of the former for oviposition, and this can more easily be gathered and burnt before reaching maturity. Date stones lying about the plantations should all be gathered and destroyed, as they are frequently infested.

Plank (H. K.). **La Hormiga Arriera y los Medios para combatirla en las Huertas de Cacao del Ecuador.** [The Control of *Atta* spp. in the Cacao Plantations of Ecuador.]—*Bol. Asoc. Agric. Ecuador, Guayaquil*, i, no. 3, May 1921, 9 pp. [Received 23rd September 1921.]

With the exception of *Monalonion atratum*, the most important pests of cacao in Ecuador are the ants of the leaf-cutting, parasol, or fungus-growing species. The most common and the most injurious are *Atta cephalotes* and *A. sexdens*. The known facts of the history, biology and habits of these ants, and the remedial measures used against them are discussed. Very few natural enemies are known in Ecuador; another species of ant is said to be predaceous on them, but cannot be considered to be in any way an adequate check.

The remedies suggested include the use of repellents, such as bichloride of mercury, and the destruction of the ants in their nests by means of poisonous gases, such as sulphur dioxide or carbon bisulphide. The quantities of the latter substance necessary for nests of various sizes are as follows:—For a small nest, comprising only one or two excavations, 30 to 50 cc.; for nests measuring up to 5 ft. in diameter, 50 to 100 cc.; for nests of 5 ft. diameter, 100 to 300 cc.; for nests larger than 5 ft., 300 to 600 cc. These are approximately the smallest doses that are effective for the sizes indicated, and they should be applied to the principal entrances, all the others having previously been sealed up. In Panama, potassium or sodium cyanide has also been used, with good results.

Entomologia.—*Bol. Asoc. Agric. Ecuador, Guayaquil*, i, no. 3, May 1921, 2 pp. [Received 23rd September 1921.]

Studies have been made of *Monalonion atratum*, Dist., of which *M. dissimulatum* is a synonym. This Capsid bug, known as the "mosquilla," is the worst pest of cacao in Ecuador. Females in captivity lay 11 to 15 eggs, but in nature this number is doubled or trebled. After about two weeks the nymphs hatch; they moult five times before becoming adults, each stage lasting from two to five days according to conditions of food and climate; the adults generally appear about one month after oviposition. Nicotine sulphate (Black-leaf 40) 1 : 800 was found to kill the various stages of nymphs in 20 to 30 minutes, but did not apparently kill the eggs. The addition of soap seemed to prevent the eggs from hatching.

Leaf-cutting ants [*Atta*] are very destructive in cacao plantations [see preceding paper], and also to oranges, cotton or beans; unfortunately very little is done to destroy the nests, although this could be effected with little expense, and the losses due to their presence are considerable. Bananas are attacked by the banana weevil [*Cosmopolites sordidus*]. Another weevil has been found in all stages on palms, and is thought to be the cause of a very common form of injury.

De Stefani (T.). *Diaspis pentagona* e *Prospaltella berlesei*.—*Allevamenti, Palermo*, ii, no. 9, 1st September 1921, p. 291.

New mulberry groves are being planted in Sicily, and in view of this renewal of the silk industry that once flourished in the island, it is pointed out that no artificial measures need be taken against *Diaspis pentagona*, provided its parasite, *Prospaltella berlesei*, is encouraged.

RIEHM (E.). **Prüfung von Pflanzenschutzmitteln im Jahre 1920.** [An Examination in 1920 of Preparations for protecting Plants.]—*Mitt. Biol. Reichsanst. Land- u. Forstw., Berlin,* no. 20, July 1921, 47 pp. [Received 24th September 1921.]

This paper summarises the results published in 1920. A similar summary for 1919 has already been noticed [*R.A.E.*, A, ix, 398].

BÖRNER (C.). **Insekten-Zeitschlüssel.** [Diagrams of Insect Development in Relation to the Calendar.]—*Arb. Biol. Reichsanst. Land- u. Forstw., Berlin,* x, no. 5, 1921, pp. 395–404.

Many diagrams and formulae have been invented to portray the development of a given insect and its progeny in relation to the calendar, the "calendar-keys" in Judeich and Nitsche's handbook on Central European forest insects, which apply to species with a simple succession of generations, being the best known. For insects with a variable generation, such as Aphids, the author's circle-diagram keys have been used since 1906. The Judeich-Nitsche system was modified and perfected by Rhumbler [*R.A.E.*, A, viii, 269] so that the keys can be printed in ordinary type with existing typographical characters.

The improvements described here are based on Rhumbler's system, but avoid his differential treatment between insects with complete and incomplete metamorphosis. They permit the representation of a life-cycle extending over several years, and of one lasting only a part of a year, and can also serve for several successive generations.

Examples comparing the Judeich-Nitsche, Rhumbler and new systems are given, and the author's circle-diagrams are also shown.

BÖRNER (C.), BLUNCK (H.), SPEYER (W.) & DAMPF (A.). **Beiträge zur Kenntnis vom Massenwechsel (Gradation) schädlicher Insekten.** [Contributions to the Knowledge of the varying Abundance of injurious Insects.]—*Arb. Biol. Reichsanst. Land- u. Forstw., Berlin,* x, no. 5, 1921, pp. 405–466, 12 figs.

As any organism that is only occasionally injurious may develop into a serious pest under certain conditions, the applied zoologist should not confine his attention exclusively to known pests. A pest becomes more dangerous as its ecological requirements are increasingly met by the environment. Any reversal of this must check its spread, and the practical significance of such cases should be investigated.

The present investigations included many series of catches aiming at establishing the numerical occurrence of a pest in a given locality. The catch made with thirty wide sweeps of a net was taken as a unit. The number of eggs and larvae was determined by counts at definite intervals, the entire plant being removed carefully in the case of larvae, such as those of *Meligethes aeneus*, that abandon their food-plant when it withers.

In 1920 the work was chiefly on *Meligethes aeneus*, F., and on the flea-beetles, *Psylliodes chrysocephala*, L., *Phyllotreta atra*, F., *P. nigripes*, F., *P. undulata*, Kutsch., and *P. vittula*, Redt. The weevils, *Ceuthorrhynchus assimilis*, Payk., *C. rübsaameni*, Kolbe, *C. sulcicollis*, Thoms., and *C. quadridens*, Panz., were also subjects of inquiry. The investigations are dealt with in detail, and from the figures obtained in the summer of 1920 data of practical value to rape cultivation in Central Europe

were ascertained. In the Naumburg region *Phyllotreta atra* is the most common and destructive species. In 1920 its infestation reached the maximum in August, but this mass occurrence was of short duration ; from 2,000 individuals per catch-unit on 4th August the number fell to 8 on 21st August in rainy weather, though a catch of 130 was taken towards the end of September. A summer crop, planted in drills on 10th August, soon recovered from attack, and the winter crops, similarly planted later, were not affected. *P. nigripes* was practically contemporaneous with *P. atra,* but of much less importance. It is clear that in dealing with these two species the winter crops must be sown from August onwards.

The conditions are different if *P. undulata* is concerned, the maximum catch-unit of 83 individuals occurring on 6th October. Whether this delay occurs each year is not yet certain. *P. undulata* was not very abundant in Naumburg in 1919 and 1920, and *P. nemorum* was not represented at all in the 1920 catches. The latter appears to reach its maximum infestation somewhat earlier than *P. atra* and *P. nigripes,* whereas *P. undulata* seems to reach its maximum after them. If *P. undulata* continues to be as rare as in 1919, it may be disregarded, and sowing may be regulated by *P. atra.* In conclusion it may be said that winter crops may be protected against flea-beetles as follows : In warm districts, and in the reduced abundance of *P. undulata,* sowing must be delayed until the mass occurrence is over ; in cool districts, and with a predominance of *P. undulata,* sowing must be advanced in order to strengthen the plants prior to infestation. The trap-crop method is useless, as the beetles oviposit only after hibernation.

It was not possible to obtain data in the spring of 1920 regarding the mass occurrence of flea-beetles in relation to the sowing time of summer crops.

As regards *Meligethes aeneus,* this beetle appears so early that there is no hope of growing a winter rape crop capable of avoiding attack on its buds by blossoming and fructifying before the appearance of the pest. In growing a winter crop other desiderata obtain, foremost being the capacity of the plant to ramify abundantly, as this permits it to outgrow the injury better than is the case with a weak plant. Trap-crops are useless for the same reason as in the case of flea-beetles. One point that seems important is the contemporaneous blossoming of the plants in various fields, as late-blossoming fields seem to attract all beetles busy with reproduction in the neighbourhood. From the catch figures of 1920 it is perhaps possible to find a way of avoiding injury by *M. aeneus,* the mass occurrence of which is in April, May and June, by replacing winter crops with summer ones. Where it is inadvisable that cultivation be restricted to summer mustard, the growing of rape crops might be confined to late summer in districts where they are annually badly injured by *M. aeneus.* It is a question of finding whether the varieties suited to sowing in late summer can be selected so as to give a larger yield without prolonging their present short time of development. The growing of such summer crops, however, involves giving up winter rape crops, for experimental sowings of summer rape, made with the object of providing food and breeding facilities for the rape pests under investigation, led to an enormous increase of a very injurious midge, *Perrisia* (*Dasyneura*) *brassicae.* This midge has several generations in the warm season, and its numbers rise rapidly when *Ceuthorrhynchus assimilis* and allied weevils facilitate its oviposition by boring into the shoots.

Even a few of these beetles suffice to assist the first summer generation of *P. brassicae*. This point must be reckoned with in planting summer rape if winter rape is grown. Another enemy of summer crops, and one difficult to combat, is the cabbage aphis [*Brevicoryne brassicae*].

The relations between *Meligethes* and *Ceuthorrhynchus* and their common parasite, the Hymenopteron, *Diospilus oleraceus*, are of great importance in the association of these pests with rape. Breeding experiments seem to show that the great abundance of *D. oleraceus* in July and August (as compared with early spring) is due to its increase at the cost of *M. aeneus*. The spring generation of *D. oleraceus* develops in the autumn larvae of *Ceuthorrhynchus rübsaameni* and *C. sulcicollis*. Infested autumn larvae carry their parasites underground and die after building their earthern cocoons, and the parasites do not pupate until spring. This explains the tardy appearance of *D. oleraceus* on blossoming winter rape, as compared with the Ophionids, *Isurgus morionellus*, Holmgr., and *I. heterocerus*, Thoms. The scantiness of *D. oleraceus* in spring is explained by the smaller numbers of *Ceuthorrhynchus* as compared with *Meligethes*. The very important check effected by *Diospilus* on *Meligethes* is thus closely connected with the occurrence of *Ceuthorrhynchus*. Where the latter or allied species are absent, *Diospilus* has no means of overwintering and must be disregarded in the control of *M. aeneus*.

Fortunately *C. rübsaameni* is of little importance as a pest of rape crops; the slight damage done by it is amply compensated by its usefulness, and no measures are required against it.

M. aeneus, *C. rübsaameni* and *C. sulcicollis*, and *D. oleraceus*, therefore form, in conjunction with winter rape, a closely interrelated biological unit, and their numerical relation to one another will probably be disturbed if winter crops are abandoned. It is remarkable that *M. aeneus* is able to reproduce itself in some numbers in early spring before the appearance of *Diospilus*, and that part of the autumn brood of *C. rübsaameni* and its eggs laid in the following spring remain uninfested by *Diospilus*; the latter would otherwise eradicate its hosts in a few years.

This adaptation of the parasite to the reproductive methods of its hosts is much simpler in the case of *Isurgus* spp. They appear in spring shortly after the oviposition of *M. aeneus* and occur through the summer, but although the larvae of *Meligethes* are thus constantly exposed to attack, the parasite is not present in excess, so that it is probable that the progeny of *Meligethes* is more numerous than that of *Isurgus*.

Another pest meriting attention is *Psylliodes chrysocephala*. This flea-beetle begins reproduction in autumn and continues it in spring after an interruption during the cold weather. It has not been very abundant around Naumburg during recent years, and in general may be held to be one of the less common species. It is possible that unfavourable hibernation conditions are responsible for this, and it would be useful to ascertain its abundance and injury in districts with lasting winter snow as compared with those in which snow is occasional or slight. Any excess of this pest need then be combated only in localities where the winter conditions favour it. Sometimes there is a marked difference in the infestation of winter crops sown at widely different dates. If one assumes that an observed freedom from infestation of rape sown in September is due to the plants not having reached by autumn a size suitable for oviposition, then it is

obvious that in regions infested with *P. chrysocephala* winter sowings should be delayed, or that *Brassica napus* be replaced by winter *B. rapa.* This retarded sowing applicable to *Psylliodes* will also serve against *Phyllotreta* spp. It was also noticed that an August field attracted all the *Psylliodes* in the neighbourhood, so that a September field remained untouched. Trap-crops could perhaps be grown with advantage; they should be in full growth in August, and may be ploughed under from mid-October onwards.

The last section of this paper deals with the application of statistical methods to cotton pests in East Africa in 1914–15. The net-catches were astonishingly varied, according to the maturity of the plants and the character of the soil. Proof was obtained that the Jassid, *Chlorita facialis,* is connected with crinkling disease. In one instance 100 sweeps of the net yielded 18 individuals in a healthy field and 720 in one near by infected with the disease.

CLAUSEN (P.). **Entwicklungsgeschichtliche Untersuchungen über den Erreger der als "Kalkbrut" bezeichneten Krankheit der Bienen.** [Investigations on the Life-history of the Causal Agent of the Bee Disease known as "Limebrood."]—*Arb. Biol. Reichsanst. Land- u. Forstw., Berlin,* x, no. 6, 1921, pp. 467–521, 24 figs., 3 plates.

The development of the fungus, *Pericytis apis,* causing "limebrood" in bees, is described.

BORCHERT (A.). **Die Formaldehyddesinfektion in der Bienenwirtschaft in der Form des Autanverfahrens sowie experimentelle Untersuchungen über die Tiefenwirkung des mit Wasserdampf gesättigten Formaldehydgases.** [The Autan Method of Formaldehyde Disinfection in Apiculture and Experiments on the Penetrative Power of Formaldehyde Gas saturated with Steam.]—*Arb. Biol. Reichsanst. Land- u. Forstw., Berlin,* x, no. 6, 1921, pp. 522–557.

For combating bee diseases, especially foulbrood, Maassen introduced an efficient method of disinfecting the combs by melting them down in a steam melter. Many apiarists have believed that formaldehyde gas is also effective for this purpose, but the investigations here described show that it is quite unsuitable.

GARDNER (J. C. M.). **The Celery Fly: Life-history, Damage to Plants, and Control.**—*Fruit-grower, Fruiterer, Florist and Mkt. Gdnr., London,* li, nos. 1,328–1,330, 12th, 19th and 26th May 1921, pp. 829–831, 863–865 and 896–897, 7 figs. [Received 26th September 1921.]

The systematic position and synonymy of *Acidia heraclei,* L. (celery fly) are discussed, and its distribution is reviewed. Its food-plants belong to the Umbelliferae and Compositae. The author has reared the species from larvae taken on celery (*Apium graveolens*), parsnip (*Pastinaca sativa*), cow parsnip (*Heracleum sphondylium*), *H. giganteum* and chervil (*Chaerophyllum cerefolium*). A description is given of the various stages. In captivity the adult flies live for about seven weeks, but under natural conditions their life is probably very much shorter. The process of oviposition is described [*R.A.E.*,. A, vi, 480]. The eggs hatch in 6 to 14 days, according to the temperature; the larval

period lasts from 14 to 19 days, and the pupal period about 27 days. Hibernation occurs in the pupal stage in England at a depth of from three to four inches in the soil. The two generations in England appear, roughly, from April to June, and from August onwards, but owing to the long period of oviposition there is a certain amount of overlapping, and all stages may be found at one time. In 1919 larvae were found in celery plants as late as 14th December. The first appearance of the fly depends on external conditions, and may take place at any time in April or May.

The parasites recorded are: the Braconids, *Alysia apii*, *Sigalphus flavipalpus*, *Aspilota fuscicornis* and *Adelura apii*; the Chalcid, *Pachylarthrus smaragdinus*; and the Ichneumonid, *Hemiteles crassicornis*; while the author has bred the Chalcid, *Halticoptera flavicornis*, the Braconids, *Opius cingulatus* and *Adelura apii*, and an unidentified larval parasite which may prove to be the last-named species.

Artificial control measures include the removal and burning of all debris after lifting the crop, the use of trap crops, the removal of wild food-plants, and spraying, which should be done just after the emergence of the flies. Sprays of 1 oz. chlor-ortho-cresol, or green tar oil, with 1 lb. soft soap and 10 gals. water, reduced the infestation by about 50 per cent.

DE LA BARREDA (L.). **Instrucciones para combatir los Gusanos que destruyen los Chilares.** [The Control of Cutworms in Chilli Plantations.]—*Rev. Agric., San Jacinto, Mexico*, vi, no. 4, August 1921, p. 234.

The chilli plantations of the General Agricultural Department are severely attacked by cutworms, which feed at night on these and other plants, while some subterranean species live on the roots. Powdered lead arsenate, Paris green or London purple, with an equal quantity of slaked lime, should be dusted on the plants, or they may be sprayed with paraffin emulsion and soap at night, when the insects are feeding. Hand collection of the cutworms, and of the pupae on or below the ground surface, is also recommended.

GLASENAP (S.). **Борьба с Вредителями Плодоводства, зимующими в состоянии Яичек.** [Control of Orchard Pests that hibernate in the Egg-stage.]—**Петроградское Огородничество. Бюллетень Сельско-Хозяйственного Отдела Петроградского Отделения Государственного Издательство.** [*Petrograd Market Gardening. Bull. Rural-Economic Dept. Petrograd Div. Gov. Publ.*], *Petrograd*, no. 8 (Supplement), 15th August 1920, 2 pp., 3 figs. [Received 26th September 1921.]

Psylla mali, Först., *Cheimatobia brumata*, L., and *Aphis pomi*, De G., are the chief orchard pests that hibernate in the egg-stage. The eggs may be prevented from hatching by spraying with lime-sulphur, used at the rate of 1 lb. flowers of sulphur and 1 lb. freshly slaked lime to about 3 gals. of water. This should be boiled and applied to the trees whilst still hot. The method of preparation is described. An alternative spray is 3 lb. water-glass and 76 lb. freshly slaked fat stone lime in 36 gals. water. This should be applied at the beginning of April.

Bogdanov-Katkov (N. N.). **Капустная Тля.** [Cabbage Aphis.]—**Издательство Народного Комиссариата Земледелия.** [*Publ. of the Nat. Commissariat of Agric.*], *Petrograd*, 1920, 20 pp., 15 figs. [Received 26th September 1921.]

This paper on the life-history and habits of *Brevicoryne* (*Aphis*) *brassicae*, L., is compiled from the works of previous authors. The usual remedial measures are discussed, and instructions are given for the preparation of tobacco extract, kerosene emulsion and soft soap for spraying purposes.

Fabrikant (A. O.). **Организация дела защиты Растений.** [Organisation of Work for the Protection of Plants.]—**Издательство Народного Комиссариата Земледелия.** [*Publ. of the Nat. Commissariat of Agric.*], *Moscow*, 1919, 56 pp. [Received 26th September 1921.]

The organisation of work for the protection of plants in Russia and other countries is reviewed.

Bogdanov-Katkov (N. N.). **Медведка** (*Gryllotalpa gryllotalpa*, **L.**).—**Издательство Народного Комиссариата Земледелия.** [*Publ. of the Nat. Commissariat of Agric.*], *Moscow, Petrograd, Kiev*, 1919, 3 pp., 3 figs. [Received 26th September 1921.]

Gryllotalpa gryllotalpa, L., is recorded from various districts in Russia as causing injury to many plants, including cabbages, potatoes, radishes, water melons and oak trees. Two of the remedial measures adopted are the use of white arsenic in the proportions of 1 lb. to 20 lb. of maize seed or flour, and kerosene mixed with sand at the rate of 7 lb. to one load of sand.

Bogdanov-Katkov (N. N.). **Капустная Белянка.** [Cabbage Butterfly.]—**Издательство Народного Комиссариата Земледелия.** [*Publ. of the Nat. Commissariat of Agric.*], *Moscow, Petrograd, Kiev*, 1919, 3 pp., 2 figs. [Received 26th September 1921.]

A brief account is given of the cabbage butterfly [*Pieris brassicae*] and its control. In the north of Russia outbreaks of this pest are sporadic, but when conditions are favourable, it occurs in great abundance and causes serious damage to many cruciferous crops, especially cabbage.

Korolkov (D. M.). **Ворьба с главнейшими Вредителями Сада, Огород и некоторыми Вредителями Поля.** [Remedial Measures against the chief Pests of the Garden, Kitchen Garden and some Field Pests.]—**Издательство Народного Комиссариата Земледелия.** [*Publ. Nat. Commissariat of Agric.*], *Moscow*, 1920, 154 pp., 48 plates. [Received 26th September 1921.]

This publication describes the general remedial measures to be adopted against various garden and field pests. Brief descriptions of the life-history of some of the insects concerned are given, as well as tables showing the plant attacked, the time and character of injury, and the remedial measures advocated. Instructions are also given for the preparation of various insecticides. A list of the pests dealt with is arranged alphabetically under the Russian popular names, but including the scientific names.

BOGDANOV-KATKOV (N. N.). **Капустная Совка и Меры Борьбы с ней.** [*Barathra brassicae* and its Control.]—**Издательство Народного Комиссариата Земледелия.** [*Publ. Nat. Commissariat of Agric.*], *Petrograd*, 1919, 3 pp., 5 figs. [Received 26th September 1921.]

The injury caused by the larvae of *Barathra brassicae* to cruciferous crops is described and illustrated, and general instructions are given for dealing with this moth.

Капустная Муха и Борьба с ней. [The Cabbage Fly and its Control.] —**Череповецкая Станция Защиты Растений от Вредителей.** [*Tcherepovetz Sta. Protect. Plants from Pests*], *Tcherepovetz*, June 1920, Seasonal Leaflet no. 2, 4 pp. [Received 26th September 1921.]

The cabbage fly [*Phorbia brassicae*] greatly increased during 1919 and 1920 in the Tcherepovetz district. Its life-history and control are briefly outlined.

Капустная Муха. [The Cabbage Fly.]—**Подотдел Борьбы с Вредителями при Комитете по Сельскому Хозяйству.** [*Sub-Dept.* (*for Control of Pests*) *of Rural Economic Committee*], *Petrograd*, April 1919, 4 pp., 5 figs. [Received 26th September 1921.]

During 1918 the cabbage fly [*Phorbia brassicae*] caused serious damage to cruciferous plants near Petrograd and in various other districts. The life-history is briefly outlined. The remedial measures advocated include cultural methods and watering with emulsions of carbolic acid or quassia and soap.

BOGDANOV-KATKOV (N. N.). **Хреновый и Капустный Листоеды или Бабанухи.** [*Phaedon cochleariae*, F., and *P. armoraciae*, L.] —**Энтомологический Кабинет** [*Minist. Ent.*], *Petrograd*, 1919, 23 pp., 21 figs. [Received 27th September 1921.]

The life-histories of *Phaedon cochleariae*, F., and *P. armoraciae*, L., are described, and remedial measures are discussed [*R.A.E.*, A, ix, 350].

Положение о Станциях Защиты Растений от Вредителей. [The Position regarding Stations for the Protection of Plants from Pests.]—[*sine loco*], January 1920, 1 p. [Received 26th September 1921.]

It is proposed to inaugurate stations for the protection of plants, with a view to assisting the population in dealing with pests and diseases and combining local remedial measures. The field of operation of such stations and suggested methods of working are described.

Конструкция Подотдела борьбы с Вредителями Сельского Хозяйства Н. К. З. [The construction of Sub-departments for the Control of Agricultural Pests.]—**Бюллетень 2го Всероссийского Энтомо-Фитопатологического Совещания в Петрограде 25–30 Октября 1920 г.** [*Bull. 2nd All-Russian Entomo-Phytopath. Conf. Petrograd, 25–30th October 1920*], *Petrograd*, no. 1, 25th October 1920, pp. 10–14. [Received 27th September 1921.]

The construction of a sub-department for the control of agricultural pests by the National Commissariat of Agriculture and the functions of its various divisions are discussed.

Andrianov (A.). **Программа Подотдела борьбы с Вредителями Сельского хозяйства Наркомзема.** [Programme of work of the Sub-department for the Control of Agricultural Pests of the National Commissariat of Agriculture.] — **Бюллетень 2-го Всероссийского Энтомо-Фитопатологического Совещания в Петрограде 25-30 Октября 1920г.** [*Bull. 2nd All-Russian Entomo-Phytopath. Conf. Petrograd, 25–30th October 1920*], *Petrograd,* no. 1, 25th October 1920, pp 14–16. [Received 27th September, 1921.]

The contents of this paper are indicated by the title.

Iatchevsky (A.). **Об об'единении научных Работ Энтомо-Фитопатологии Центральными Учреждениями.** [The question of uniting Entomo-Phytopathological Work by means of Central Institutions.]—**Бюллетень 2-го Всероссийского Энтомо-Фитопатологического С'езда в Петрограде 25-30 Октября 1920г.** [*Bull. 2nd All-Russian Entomo-Phytopath. Meeting, Petrograd, 25–30th October 1920*], *Petrograd,* no. 3, 27th October 1920, pp. 2–6. [Received 27th September 1921.]

The advantages of central institutions for the purpose of collecting information on the pests and diseases of plants are discussed, with special reference to existing conditions in Russia, where at present there are very few specialists in these branches of science. The work of such institutions should also include the training of future specialists.

Bogdanov-Katkov (N. N.). **К Вопросу о подготовке Специалистов, Инструкторов и Техников по Прикладной Зоологии.** [On the Question of the Preparation of Specialists, Instructors and Technical Officers in Applied Zoology.] — **Бюллетень 2-го Всероссийского Энтомо-Фитопатологического С'езда в Петрограде 25-30 Октября 1920 г.** [*Bull. 2nd All-Russian Entomo-Phytopath. Meeting, Petrograd, 25–30th October 1920*], *Petrograd,* no. 3, 27th October 1920, pp. 6–15. [Received 27th September 1921.]

The organisation of special courses of instruction in applied zoology is discussed, and a programme for them is outlined.

Semenov-Tian-Shansky (A. P.). **Очерк Деятельности Русского Энтомологического Общества за пятилетие 1916-1920 гг.** [Report on the Activities of the Russian Entomological Society for the Five Years 1916–1920.]—**Бюллетень 2-го Всероссийского Энтомо-Фитопатологического С'езда в Петрограде 25-30 Октября 1920 г.** [*Bull. 2nd All-Russian Entomo-Phytopath. Meeting, Petrograd, 25–30th October 1920*], *Petrograd,* no. 6, 30th October 1920, pp. 1–17. [Received 27th September 1921.]

A brief account is given of the conditions under which the Russian Entomological Society carried out its work during the adverse circumstances of 1916 to 1920. A long list is also given of eminent members who died within this period.

IACOBSON (G. G.). **О земляных Блошках (Coleoptera, Chrysomelidae, Halticini).** [On Flea-beetles (Coleoptera, Chrysomelidae, Halticini).]—**Бюллетень 2-го Всероссийского Энтомо-Фитопатологического С'езда в Петрограде 25–30 Октября 1920 г.** [*Bull. 2nd All-Russian Entomo-Phytopath. Meeting, Petrograd, 25–30th October 1920*], *Petrograd*, no. 7, 1st December 1920, pp. 4–6. [Received 27th September 1921.]

A brief account is given of the HALTICINI in general, their anatomy, classification and distribution in Russia and Siberia.

RIMSKI-KORSAKOV (M. N.). **Паразиты Насекомых, вредящих Рыбоводству.** [Parasites of Insects injurious to Pisciculture.]—**Бюллетень 2-го Всероссийского Энтомо-Фитопатологического С'езда в Петрограде 25–30 Октября 1920 г.** [*Bull. 2nd All-Russian Entomo-Phytopath. Meeting, Petrograd, 25–30th October 1920*], *Petrograd*, no. 7, 1st December 1920, pp. 6–8. [Received 27th September 1921.]

The application of the biological method in controlling the insects injurious to fish culture is urged, and a list of their parasites occurring in Russia is given. These are chiefly Mymarids and Trichogrammatids, and include *Prestwichia aquatica*, Lubbock, parasitic on eggs of *Dytiscus*, widely distributed in Central Russia ; *P. solitaria*, Ruschka, parasitic on the eggs of various dragonflies (*Aeschna, Lestes, Agrion*) ; *Cataphractus cinctus*, Haliday ; *C. reductus*, sp. n. ; *Anaphes dytiscidarum*, sp. n. ; *Anagrus subfuscus*, Först., a parasite of the eggs of *Agrion, Lestes* and *Calopteryx* ; *Mestocharis* sp. ; and a Eulophid, parasitising eggs of various dragonflies.

Most of the species recorded have three and sometimes four generations a year. The entire development of the parasites takes place in the egg of the host, with the exception of the Eulophid, in which case the full-grown larva emerges from the egg and lives on aquatic plants, where pupation also occurs.

REICHARDT (A. N.). **О Долгоносиках из Рода** *Ceuthorrhynchus*, **Germ., вредящих Крестоцветным.** [*Ceuthorrhynchus* spp. injurious to Cruciferae.]—**Бюллетень 2-го Всероссийского Энтомо-Фитопатологического С'езда в Петрограде 25–30 Октября 1920 г.** [*Bull. 2nd All-Russian Entomo-Phytopath. Meeting, Petrograd, 25–30th October 1920*], *Petrograd*, no. 7, 1st December 1920, pp. 28–30. [Received 27th September 1921.]

Ceuthorrhynchus quadridens, Panz., is the chief weevil pest of kitchen gardens in the Petrograd district. It probably also occurs in the Moscow and Kiev districts. In the Petrograd district the adults appear about the middle of May, and the eggs are usually deposited in the midrib of the leaves or in the stalk of the plants, towards the end of the month. The larvae are found in June, an average of about seven to ten occurring in each plant ; occasionally as many as twenty may be present. As a result of injury the plants may become stunted in growth or even be killed, and the larval exit hole frequently becomes the seat of secondary infection. The larvae are often found together with those of *Phorbia* (*Chortophila*) sp., to which fly the condition of the plant is often wrongly attributed. The larvae of *C. quadridens* are parasitised by an Ichneumonid and a fungus.

Ceuthorrhynchus rapae, Gyll., is recorded from Petrograd on cabbages, *C. erysimi*, F., *C. contractus*, Marsh., *C. scapularis*, Gyll., and *C. pervicax*, Wse., on cruciferous weeds, and another species of this genus as forming galls on the roots of wild radishes.

Shtakelberg (A. A.). **К Методике Фенологических Наблюдений.** [On the Method of Phenological Observations.]—**Бюллетень 2-го Всероссийского Энтомо-Фитопатологического С'езда в Петрограде 25–30 Октября 1920 г.** [*Bull. 2nd All-Russian Entomo-Phytopath. Meeting, Petrograd, 25–30th October 1920*]. *Petrograd*, 1st December 1920, no. 7, pp. 30–35. [Received 27th September 1921.]

The value of a study of the relation of climatic conditions to entomological work is emphasised, and the method of preparing records is discussed.

Bogdanov-Katkov (N.). **О Русской Литературе по С. Х. Энтомологии за последнее пятилетие.** [Russian Literature on Rural-Economic Entomology during the last Five Years.]—**Бюллетень Постоянного Бюро Всероссийских Энтомо-Фитопатологических Съездов.** [*Bull. Permanent Bur. All-Russian Entomo-Phytopath. Meetings*], *Petrograd*, no. 1, 15th June 1921, pp. 10–11.

Attention is called to the lack of reliable scientific works on economic entomology and the inaccuracy of existing ones in Russia during 1916 to 1921.

Bogdanov-Katkov (N.). **Заметка по Hemiptera-Homoptera Черноморской Губернии и Кубанской Области.** [Notes on Hemiptera-Homoptera of the Black Sea District and Kuban Province.] —**С.-Х. Учебный Комитет, Отдел Прикладной Энтомологии,** [*Sci. Committee Rural Economy, Dept. App. Ent.*], *Petersburg*, 1921, 8 pp. [Received 26th September 1921.]

This list records some 39 species of Homoptera from the north-west of the Caucasus.

Ion (O. I.) **Как собирать и сохранять Трипсов.** [How to collect and preserve Thrips.]—**Петроградский Агрономический Институт. Научно-Исследовательский Отдел. Энтомологическая Станция** [*Petrograd Inst. Agronom. Sci. Dept., Ent. Sta.*] *Petersburg*, Ser. B. no. 1, 1921, 8 pp., 2 figs. [Received 26th September 1921.]

The contents of this paper are indicated by its title.

Dankov (A.). **Главнеишие Вредители Полеводства Тульской Губ., ожидаемые в 1921 году, краткий Образ их Жизни и простейшие Меры Борьбы.** [The chief Field Pests of the Tula District expected in 1921, brief Life-histories and simplest Remedial Measures.]—**Тульская Станция Защиты Растений от Вредителей,** [*Tula Sta. Protect. Plants from Enemies*], *Tula*, 18th March 1921, pp. 1–14, 6 figs. [Received 28th September 1921.]

This paper gives a brief account of the life-histories of and remedial measures against the pests that may be expected to appear during 1921 in the Tula district.

Those dealt with include : Frit fly [*Oscinella frit*, L.], Hessian fly [*Mayetiola destructor*, Say], the cutworm [*Euxoa segetum*, Schiff.] infesting winter crops, *Loxostege sticticalis*, L., and locusts.

GARMAN (H.). **A Destructive Bud-worm of Apple Trees** (*Haploa lecontei*).—*Kentucky Agric. Expt. Sta., Lexington,* Circ. 25, June 1921, 11 pp., 5 figs. [Received 27th September 1921.]

The caterpillars of the Arctiid moth, *Haploa lecontei*, are recorded from Kentucky as injuring young apple trees by devouring the buds. They will also readily eat buds of the native crab-apple (*Pyrus angustifolia*), Japanese quince (*P. japonica*), pear, peach and wild cherry (*Prunus serotina*). As the buds unfold, the young leaves are also eaten. Pupation occurs towards the end of April and lasts about a month. Some adults reared from larvae on apple proved to be the variety *fulvicosta*. This is the insect recorded in 1871 by Riley as the " blue-spangled peach worm " and identified by him as *Callimorpha fulvicosta*.

It is thought that the larvae crawl up the trunk, in which case early spraying with lime-sulphur should act as a deterrent. It is supposed that hibernation occurs on the ground ; should this be the case a strip of tin covered with coal tar or tanglefoot should be tried. Spraying with lead arsenate is said to be unsuccessful.

TURINETTI (L.). **Sur la Présence en France du** *Lonchaea aristella*, **Beck. (Dipt. Lonchaeidae)**.—*Bull. Soc. Ent. France, Paris,* no. 13, 13th July 1921, pp. 195–196.

Lonchaea aristella, Beck., is recorded from Mentone as attacking figs. It has apparently existed for several years in this locality, but *Pachyneuron vindemmiae*, Rond., a parasite of this fly, has not yet been observed there [*cf. R.A.E.*, A, ix, 545].

PICARD (F.). **Sur la Biologie du** *Tetrastichus rapo*, **Walk. (Hym. Chalcididae)**.—*Bull. Soc. Ent. France, Paris,* no. 14, 27th July 1921, pp. 206–208.

Tetrastichus rapo, Wlk., oviposits in cocoons of the Braconid, *Apanteles glomeratus*, and the Ichneumonid, *Anilasta ebenina*, and also in the larvae of *Apanteles* when within their host, *Pieris brassicae*. The female Chalcid is unable to distinguish between parasitised and non-parasitised larvae of *P. brassicae*, and will oviposit in either, whether young or old. The young larvae invariably succumb to the attack, but the older ones may still complete their development.

When *T. rapo* oviposits in larvae of *Pieris brassicae* containing *Apanteles*, although it causes the death of the latter, it can only complete its own development if the Braconid is in a stage favourable for that process.

CHOPARD (L.). **Note sur quelques Espèces de Rhaphidophorinae (Orth. Phasgonuridae)**.—*Bull. Soc. Ent. France, Paris,* no. 14, 27th July 1921, pp. 209–210.

In reviewing the systematic position of *Tachycines asynamorus*, Ad., and *Diestrammena marmorata*, De Haan, the author states that *Paradiestrammena* erected by him in 1919, is a synonym of *Diestrammena*, Brunner 1888, and that *Diestrammena*, Chopard, is identical with

Tachycines, Adelung 1902. Other species, the systematic position of which is dealt with, are *D. unicolor*, Br., from Siberia, China and Japan, and *D. apicalis*, Br., from Japan. *T. asynamorus* occurs in Europe and the United States in greenhouses, but originally came from Japan, and *D. marmorata* has only been recorded from Japan.

Green (E. E.) & Laing (F.). **Coccidae from the Seychelles.**—*Bull. Ent. Res., London,* xii, pt. 2, September 1921, pp. 125–128, 4 figs.

The new species described are: *Pseudaonidia iota,* on leaves of *Eugenia caryophyllata* ; *P. aldabraca,* on bark of " Bois d'Amande " [*Mahurea speciosa*] ; and *Aonidia obtusa,* on *Verschaffeltia splendida.*

New additions to the list of Coccids recorded from the Seychelles are: *Ceroplastes rubens,* Mask., on a fern (*Acrostichum* sp.) ; *Chionaspis subcorticalis,* Green, on tomatos from Astove Island and on *Sida* sp. from Assumption Island, hitherto only recorded from Ceylon ; *Pinnaspis buxi,* Bch., on *Pandanus seychellarum* from Felicité Island and on *Areca catechu* ; and *Diaspis flacourtiae,* Rutherf., on *Flacourtia,* causing abnormal growth on the older and mature branches, previously known only from Ceylon.

Lyle (G. T.). **On three new Species of Indian Braconidae.**—*Bull. Ent. Res., London,* xii, pt. 2, September 1921, pp. 129–132, 2 figs.

The new Braconids described are: *Microplitis similis,* a parasite of *Agrotis ypsilon,* L., in Bihar and Orissa and in Bengal ; and *M. eusirus* and *Rhogas* (*Heterogamus*) *percurrens,* reared from *Achaea janata,* L., in Bihar and Orissa.

Scott (H.). **The Ptinid Beetle,** *Trigonogenius globulum,* **Solier, breeding in Argol.**—*Bull. Ent. Res., London,* xii, pt. 2, September 1921, pp. 133–134.

The Ptinid, *Trigonogenius globulum,* Solier, originally described from Chile, is very widely distributed. In England it has been found in cotton mills, corn mills and granaries, under timber and among wood shavings. It is here recorded in numbers in a jar of argol containing about 80 per cent. of potassium bitartrate, which had been tightly corked for about seven years. The results of subsequent experiments indicate that the beetles did not feed exclusively on potassium bitartrate, but also, partly at least, on the ingredients forming the other 20 per cent. of the argol. Attempts to start breeding in pure cream of tartar failed. When the beetles are bred in oatmeal or raisins the generations succeed one another more rapidly than when argol is the breeding medium, in which case there is only about one generation a year.

Marshall (G. A. K.). **On New Species of Curculionidae attacking Forest Trees in India.**—*Bull. Ent. Res., London,* xii, pt. 2, September 1921, pp. 165–180, 13 figs.

The new weevils described are:—*Sympiezomias beesoni,* from Madras, feeding on leaves of young teak and in some cases defoliating the trees ; *Alcides dipterocarpi,* bred from seeds of *Dipterocarpus,* from the United Provinces ; *Mecistocerus fumosus,* on *Pinus longifolia,*

from the United Provinces; *Rhadinomerus bombacis*, bred from logs of *Bombax malabarica*, from the United Provinces, also from Bihar and Orissa; *R. diversipes*, bred from *Eugenia jaman* and *Shorea robusta*, from the United Provinces; *R. malloti*, bred from *Mallotus philippinensis*, from the United Provinces; *R. subfasciatus*, bred from *Shorea robusta* and *Eugenia*, from the United Provinces, *Rhadinopus buteae*, bred from *Butea frondosa*, from the United Provinces; and *Osphilia odinae*, bred from *Odina wodier* and *Cassia fistula*, from the United Provinces.

D'EMMEREZ DE CHARMOY (D.) & GEBERT (S.). **Insect Pests of various Minor Crops and Fruit Trees in Mauritius.**—*Bull. Ent. Res., London*, xii, pt. 2, September 1921, pp. 181–190, 1 fig.

Some of the more important of the pests dealt with are :—on cotton, *Heliothis* (*Chloridea*) *obsoleta*, F., *Earias insulana*, Boisd., and *Dysdercus* spp.; on tobacco, *Prodenia litura*, F., *Spodoptera mauritia*, Boisd., *H. obsoleta* and *Heterodera radicicola*; on maize, *Sesamia vuteria*, Stoll (parasitised by *Telenomus* sp., *Trichogramma australicum*, Gir., *Henicospilus antancarus*, Morl., and *Stauropodoctonus mauritii*, Morl.) and *H. obsoleta*, which often feeds on the silks; on manioc (*Manihot utilissima*), *Chionaspis* and *Lachnosterna smithi*, Arr.; on sweet potato (*Ipomoea batatas*), the Pterophorid, *Trichoptilus wahlbergi*, L., feeding on the leaves and tender buds, and *Cylas formicarius*, F.; on *Cajanus indicus*, the Lycaenids, *Lampides baetica*, L., *Zizera lysimon*, Hb., *Tarucus telicanus*, Lang, and *Nacaduba mandersi*, H. H. D., and the Pyralids *Botys* spp.; on *Canavalia ensiformis*, *Argyroploce rhynchias*, Meyr.; on *Vigna catjang* and haricot beans (*Phaseolus vulgaris*), *Agromyza phaseoli*, Coq., and *Pelamia repanda*, F.; on peas (*Pisum sativum*), *Lampides baetica*, L.; on *Arachis hypogaea*, *Heliothis obsoleta* and *Phytometra* (*Plusia*) *orichalcea*, F., attacking the leaves, *Ephestia cautella*, Walk., the fruit, and *Pseudococcus calceolariae*, Mask., the roots; on pumpkins, melons, cucumbers, etc., the fruit-flies, *Dacus sygmoides*, Coq., and *D. d'emmerezi*, Bezzi, and the Pyralid, *Glyphodes indica*, Snd.; on Cruciferae (cabbage, cauliflower, etc.), *Crocidolomia binotalis*, Z., *Plutella maculipennis*, Curt., and *Brevicoryne* (*Aphis*) *brassicae*, L., on which *Xanthogramma pfeifferi* and *Chilomenes lunata* are predaceous; on artichoke, *Porpe bjerkandrella*, Thunb., and *Macrosiphum picridis*, F.; on tomato, the pests occurring on tobacco, especially *Heterodera radicicola*; on coconut, *Oryctes tarandus*, Oliv., and *Diaspis boisduvali*, Sign.; on coffee, *Cratopus punctum*, Boh., *Botys octoguttatus* (possibly *Thliptoceras octoguttalis*, Feld., according to an editorial footnote) and *Coccus viridis*, Green; on limes and other species of *Citrus*, *Papilio demodocus*, Esp., and the scale-insects, *Chrysomphalus aurantii*, Mask., *C. ficus*, Ashm., *Chionaspis citri*, Comst., *Pseudaonidia trilobitiformis*, Green, *Lepidosaphes gloveri*, Pack., *Saissetia oleae*, Bern., *S. hemisphaerica*, Targ., *Coccus viridis*, Green (parasitised by the Chalcids, *Diversinervus silvestrii*, Watrst., and *Tetrastichus sicarius*, Silv.), *Icerya seychellarum*, Westw., *Pseudococcus citri*, Risso, and *P. filamentosus*, Ckll.; on mango, the Longicorn, *Batocera rubus*, L., the Cecidomyiid, *Procontarinia matteiana*, Kieff., and the Coccids, *Coccus mangiferae*, Green, *C. hesperidum*, L., *Eucalymnatus tessellatus*, Sign., *Chionaspis dilatata*, Green, *Pseudaonidia trilobitiformis*, Green, *Vinsonia stellifera*, Westw., and *Icerya seychellarum*, Westw.; on peaches, *Diaspis* (*Aulacaspis*) *pentagona*, Targ., and *Cydia pomonella*, L.; and on bananas, *Cosmopolites sordidus*, Germ.

Report on the Agricultural Department, Tortola, Virgin Islands, 1919-20.—*Barbados*, 1921, 12 pp. [Received 27th September 1921.]

The cotton worm, *Alabama argillacea*, the cotton-stainer, *Dysdercus andreae*, and the leaf-blister mite, *Eriophyes gossypii*, were the chief insect pests of cotton, but only moderate and isolated outbreaks of pests and diseases were noticed during the year. Only 2·1 per cent. of the year's crop was affected by stainers.

Treherne (R. C.). **The Colorado Potato-beetle. The well-known Eastern Potato-bug in British Columbia.**—*Agric. Jl., Victoria, B.C.*, vi, no. 7, September 1921, p. 164.

The Colorado potato-beetle, *Leptinotarsa decemlineata*, has now spread to British Columbia. The history of this pest in the United States is outlined, and the usual remedial measures are described: these can check its development, but its eradication is difficult. Its life-history in British Columbia has not yet been studied.

Carpenter (G. H.). **Insect Transformation.**—*London*, Methuen & Co., Ltd., 1921, x+282 pp., 4 plates, 124 figs. Price 12*s*. 6*d*. net.

In this book the subject of metamorphosis among insects is expounded in a manner that may prove of service to the student and to the general reader. The descriptions of outward and inward growth and change are fully illustrated.

The chapter of the greatest interest from the economic standpoint is that headed "Growing Insects and their Surroundings," which is a study of the relation of environment to insect transformation, and the numerous insects that are selected as illustrations are almost all of economic interest. This not only involves notes on the very varied forms of insect injury to plants, such as that caused by gipsy moth (*Porthetria dispar*), winter moth (*Cheimatobia brumata*), sawflies, Capsid bugs, Aphids, insects that feed underground, leaf-miners, stem-miners and many others, but also includes a survey of predaceous insects, parasites and hyperparasites. An understanding of the effect of environment on insect life, in devising methods of control, both natural and artificial, is essential, and the general review here provided is likely to prove very helpful in this connection.

The Pink Bollworm in Porto Rico.

The Director of the Imperial Bureau of Entomology has received the following information from Mr. G. N. Wolcott, Entomologist, Porto Rico Insular Experiment Station, in a letter dated 18th October, 1921:—The pink bollworm of cotton, *Platyedra* (*Pectinophora*) *gossypiella*, Saunders, has been found in Porto Rico. The first specimens were collected by Sr. Torres in caravonica, or tree cotton, in Humacao on the east coast nearest to St. Croix; but it has since been found in other parts of the island, especially in the commercial cotton growing district between Arecibo and Aguadilla, and the most heavily infested plant was at Yauco on the south coast. A larva has also been found in an okra pod.

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THE REVIEW OF APPLIED ENTOMOLOGY

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Uvarov (B. P.). **A Revision of the Genus** *Locusta*, **L.** (= *Pachytylus*, **Fieb.), with a new Theory as to the Periodicity and Migrations of Locusts.**—*Bull. Ent. Res., London*, xii, pt. 2, September 1921, pp. 135–163, 8 figs.

Not less than 16 species have been attributed to the genus *Locusta*, L., by different authors. This number had already been reduced by earlier revisers, but Kirby in his Catalogue of Orthoptera still mentioned seven distinct species. The author's conclusion—based on the morphological analysis of very extensive series of specimens, as well as on field observations conducted for several years, and on breeding experiments—is that the species of *Locusta* present a far greater variability than might have been anticipated, and that only two species can be distinguished, namely, *L. migratoria*, L., and *L. pardalina*, Wlk.; the latter, however, differs from *L. migratoria* in so many important characters that a new genus, *Locustana*, is here erected for it.

The inter-relations of the three more or less constant forms of *L. migratoria* are fully discussed, and the conclusion is drawn that these three forms—*migratoria* L., *migratorioides*, Rch. & Frm., and *danica*, L.—cannot be separated specifically, and that they represent taxonomic units of lower grade than a species; they are, however, quite distinct from each other, though connected by transitional forms and even able to undergo a transformation (during two or more subsequent generations) into each other. These forms the author proposes to call "phases" of the species. The oldest, ancestral phase of the species is considered to be *migratorioides*, which is far more constant in its morphological and colour characters than the more plastic *migratoria* and still more variable *danica*. It is distributed all over the tropics and subtropics of the Eastern Hemisphere (to which the whole genus *Locusta* is peculiar, since all records of the occurrence of it in America are incorrect); its permanent breeding regions have not yet, however, been located.

The best conditions for the development of this form seem to be present in tropical countries with a rather damp and hot climate; the sites of breeding grounds are certainly not forests, but most probably impenetrable jungles overgrown with high grasses, reeds and similar vegetation. The development of *migratorioides* in its breeding grounds is subject to a periodical rise and fall, though the exact cause of this is as yet unknown. When the increase is at its height, large swarms are formed, and their emigration from the breeding grounds follows. Such emigrating swarms settle down and oviposit whenever they are compelled to do so. Physiological causes, such as reduction of the air-sacs, exhaustion of the fat-body and development of the reproductive organs are the sole factors that bring this about. The resulting progeny undergoes a transformation into the solitary *danica* phase.

The *danica* phase, which is very plastic, easily adaptable, and cryptically coloured in all stages of its development, plays an important part in the extension of the range of the species, gradually but steadily populating new regions. Being a product of a mutation arising partly from some unknown internal cause and partly from external (probably climatic) influences, it is subject to sudden displays of atavism, resulting in the reappearance of the ancestral phase, *migratorioides*. This phenomenon is favoured and probably often caused by the oviposition of *danica* taking place under conditions resembling those

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of the permanent breeding grounds of *migratorioides*. The gregariousness of the *migratorioides* phase is one of the causes of a rapid increase in the number of individuals and swarms; in the course of a few generations the size of the swarms reaches the maximum, and this is followed by emigration. In this way the dispersion of the species is carried on alternately by the gradual spreading of the *danica* phase and by the periodical extensive emigrations of *migratorioides*. As a result, the species is now distributed all over the Eastern Hemisphere.

In the Palaearctic region the swarming phase is represented not by *migratorioides*, but by *migratoria*, which stands, as regards its morphological characters, between *migratorioides* and *danica*. This fact is explained by the impossibility of finding in the Palaearctic region natural conditions exactly like those of the tropical breeding grounds of *migratorioides*, chiefly in regard to a combination of heat and dampness. The nearest approach to tropical conditions in the Palaearctic region is represented by vast reed-beds of *Phragmites* in the deltas of the large rivers emptying into the Caspian and Aral Seas and Lake Balkhash, and there the permanent breeding grounds of *migratoria* are concentrated. Though very peculiar, and in summer recalling the tropics, the climatic conditions of these reed-beds are not tropical, and the effect on the progeny of *danica* is not the same as in the tropical breeding grounds of *migratorioides*; the reverse transformation of *danica* into a swarming phase does not reach the extreme phase of *migratorioides*, but stops half-way at the *migratoria* phase. This seems to indicate that the transformation is due primarily to the direct influence of external conditions, its extent being proportional to changes in the latter, but only precise laboratory investigations can clear up this complicated problem. The development of *migratoria* in the permanent breeding grounds goes on, as is the case with *migratorioides*, alternately with periodical emigrations, which are due not to the lack of food resources, but to some internal causes, and are followed by transformation into *danica*.

The theory of phases suggests the possibility of the control of *migratoria* by some measures directed not against the insect itself, but against certain natural conditions existing in breeding regions that are the direct cause of the development of the swarming phase. Even a comparatively slight cultivation of breeding grounds leads to the desired changes, rendering the transformation of the harmless *danica* phase into swarming *migratoria* impossible.

A study of *Locustana pardalina*, Wlk., which is peculiar to South Africa, shows that it also has two distinct phases—the swarming phase, *pardalina*, and the solitary, harmless phase, to which the name *solitaria* is here given. The transformation of one phase into the other is proved, but the conditions necessary for it remain unknown, as the breeding grounds of this species have not yet been investigated. The inter-relation between *pardalina* and *solitaria*, as regards the morphological characters, coloration of larvae and adults, and behaviour, is very much the same as in *danica* and *migratoria*.

The causes of migration of larval and adult swarms of *migratoria* are discussed, and the conclusion is arrived at that lack of food has nothing to do with the movement of larval swarms, which are guided chiefly by two causes—the instinct of gregariousness, and thermotropism. The flying swarms, too, are not driven to wander by hunger and they do not even feed much during migration, but exist at the

expense of their fat-bodies. The cessation of flight is also due to physiological causes, and is not connected with the finding of places suitable for the oviposition.

A full description of the phases of both species is given in this important and interesting paper.

DRY (F. W.). **The Egg Parasites of the Coffee Bug** (*Antestia lineaticollis*, **Stål) in Kenya Colony.**—*Bull. Ent. Res., London*, xii, pt. 2, September 1921, pp. 191–201.

Some of the information here given concerning *Hadronotus antestiae* and *Telenomus truncativentris* parasitising *Antestia lineaticollis*, Stål, has already been noticed [*R. A. E.*, A, vii, 406], the parasites being referred to as "A" and "B" respectively. The present observations show that *Telenomus* passes through its life-cycle rather more quickly than *Hadronotus*, but in hotter weather the life-cycle of the latter is more accelerated in proportion. Under laboratory conditions more females than males were bred from *H. antestiae*, whereas in *T. truncativentris* the proportion of males was greater. The highest number of offspring from one individual of *H. antestiae* was 34, and from *T. truncativentris* 12. More than one parasite has never been reared from one egg of the host.

Of 16,531 eggs of *Antestia lineaticollis* collected between July 1917 and September 1920, 78 per cent. were parasitised, the monthly percentage of parasitism ranging from 54 to 90 per cent.

Many eggs that are parasitised do not give rise to parasites. The cause of this has not yet been investigated, but it is not improbably due to the presence of superparasites and hyperparasites. The variations in the frequency of the two species are considerable, but the numbers over a long period are fairly evenly balanced.

Antestia usually exists in plantations in small numbers only, but wherever it was found, parasitised eggs were also always present. These parasites have been known to control outbreaks of *Antestia* without artificial measures being taken.

EVANS (H. H.). **Codling Moth Control in British Columbia.**—*Agric. Jl., Victoria, B.C.*, vi, no. 7, September 1921, pp. 170–171, 3 figs.

This is a brief review of the economic importance of the codling moth, *Cydia pomonella*, in British Columbia. Between 1905 and 1920 sixteen, or possibly seventeen, outbreaks have been discovered; of these ten have been completely eradicated, and the work is still being carried on in six different areas with distinct hopes of complete success. In 1920 the average cost of spraying against codling moth was about £5 an acre in the Wenatchee district of the adjoining State of Washington, but in spite of this over £200,000 worth of fruit was rendered unmarketable. If a relative degree of infestation were present in the Okanagan Valley to-day, the loss would be over £100,000, to which the cost of remedial measures must be added.

Fruit-refrigerator cars appear to be the chief cause of infestation, and a system of inspection now exists, while it is hoped to devise a practical method of superheating such cars in order to destroy all insect life. The measures at present used are quarantining infested areas, spraying, banding, fruit inspection, car inspection, and crop destruction in the blossoming period in districts where it proves to be necessary.

Froggatt (W. W.). **A Descriptive Catalogue of the Scale-insects ("Coccidae") of Australia. Part II.**—*Dept. Agric. N.S.W., Sydney,* Sci. Bull. 18, June 1921, 159 pp., 111 figs.

The new species described in this catalogue are:—Lecaniinae: *Ceronema caudata* on *Eucalyptus robusta*; *Pulvinaria contexta* on *Bossiaea* sp. and *Dillwynia juniperina*; *P. darwiniensis*, on *Caladium*; *P. greeni* on *Myoporum deserti*; *P. newmani* on *Jacksonia*; *P. salicorniae* on *Salicornia*; *P. theae* on *Thea viridis*; *Tectopulvinaria loranthi* on a *Loranthus* parasitic on *Eucalyptus*; *Ctenochiton serrata* and *C. transparens* on *Acacia*; *Lecanium cappari* on *Capparis mitchelli*; and *L. synapheae* on *Synaphea petiolaris*. Dactylopiinae: *Lecaniodiaspis convexus* on *Eucalyptus*; *L. dilatata* on *Acacia discolor*; *L. frenchi* on *Eucalyptus*; *L. microcibraria* on *Epacris impressa*; *L. newmani* on *Eucalyptus*; *Cerococcus auranticus* on *Busaria spinosa*; *C. pyriformis* on an undetermined shrub; *Rhizococcus bicolor* on *Acacia*; *Gossyparia syncarpiae* on *Syncarpia laurifolia*; *Eriococcus angulatus* on *Araucaria excelsa*; *E. busariae* on *Busaria spinosa*; *E. crofti* on *Eucalyptus piperita*; *E. gregarius* on *Eucalyptus*; *E. irregularis* on *Eucalyptus piperita*; *E. picta* on *Eucalyptus*; *E. tessellatus* on *Eucalyptus*; *E. villosa* on *Busaria spinosa*; *Erium frenellae* on *Frenella robusta*; *E. newmani* on *Grevillea*; *Dactylopius candidus* on *Acacia decurrens*; *D. hilli* on *Acacia*; and *Pseudococcus stolatus* on *Myoporum deserti*. Brachyscelinae: *Apiomorpha frenchi* and *A. globosa* on *Eucalyptus rostrata*; and *A. hilli* on *E. miniata*.

Allen (W. J.). **Fumigation versus Spraying for Scale-insects.**—*Agric. Gaz. N.S.W., Sydney,* xxxii, pt. 8, August 1921, p. 542.

Experience shows that even the best sprays are inconsistent in their effect when applied against scale-insects, whereas fumigation is most reliable if properly carried out.

Allen (W. J.). **Combined Sprays.**—*Agric. Gaz. N.S.W., Sydney,* xxxii, pt. 8, August 1921, p. 559.

In making combined sprays it is essential that the quantities are correct. To make a spray of 100 gals. of lead arsenate and nicotine solution at the rate of 1 lb. of arsenate to 25 gals. of water and concentrated nicotine solution 1 pt. to 100 gals. of water, the best way is to mix the 4 lb. of lead arsenate in 95 gals. of water, to which the pint of nicotine concentrate, mixed with 4 gals., 7 pts. of water, should be added.

Nicholls (H. M.). **The Chemistry of Spray Mixtures.**—*Tasmania Dept. Agric., Hobart,* Bull 97, 1920, 7 pp. [Received 30th September 1921.]

A simple explanation is given of the chemical reactions that take place in the making of the principal sprays and the chemical characters of the materials used. The sprays dealt with are lime-sulphur solution, Bordeaux mixture, Burgundy mixture, iron-sulphide sprays, nicotine, arsenical sprays and combined sprays.

JOHNSTON (T. H.). **Biological Control of the Prickly-pear Pest.**—*Queensland Agric. Jl., Brisbane,* xvi, no. 2, August 1921, pp. 65–68.

A few years ago it was estimated that over 22,000,000 acres in eastern Australia were infested with prickly pear, or one-third more than the total cultivated area in the continent.

Attempts have been made to control this pest by legislation, by mechanical methods, by chemical means, and, to a slight extent, by biological agencies. The most effective, so far, has been the chemical method, but its cost is frequently prohibitive, and it does not afford protection against fresh invasions of the plant.

The biological method has not yet been given a fair trial. As a result of the work of the Travelling Commission appointed by the Queensland Government, two natural enemies, *Dactylopius* (*Coccus*) *confusus indicus* and *D.* (*C.*) *confusus capensis* were introduced [*R. A. E.*, A, iii, 125] and became established. It is unfortunate that they attack *Opuntia monacantha* only, to which the former is so injurious as to effect eradication in all districts where it has access to this cactus. It is possible that *D.* (*C.*) *confusus indicus* may be a native of South America, and that the species described from Argentina, *Coccus argentinus,* may be synonymous. It is also possible that *D. confusus indicus* may not normally attack *O. monacantha* in South America, but that it may infest some other species of cactus in a less injurious manner.

The above-recorded success led the Commonwealth Institute of Science and Industry to invite the co-operation of the Governments of the Commonwealth, New South Wales and Queensland, and a scheme, which came into operation officially in June 1920, was devised to provide for the collection and shipment of desired material from North and South America.

The author brought some natural enemies from South America, the chief being two fungi, *Sclerotinia cactacearum* and *Montagnella opuntiarum,* and a Syrphid fly. The fungi are being experimented with ; the flies that were bred from the imported Syrphid larvae have failed to reproduce themselves.

A collection of cactus insects, fungi and bacteria that has been recently received from southern Florida and Texas includes the moth-borer, *Melitara prodenialis* ; the weevils, *Gerstaeckeria hubbardi, G. nobilis, G. porosa, G. clathrata,* and *G. basalis* ; the bugs, *Chelinidea vittigera* and another species of this genus ; one or two kinds of wild cochineal insects ; three or four species of scavenging flies which breed in injured plants—*Volucella esuriens, V. fasciata, Copestylum marginatum* and a large dark-coloured species of *Hermetia* ; four fungi, *Gloeosporium lunatum, Hendersonia opuntiae, Phoma* sp. and *Perisporium wrighti* ; and a bacterial rot.

A consignment of material from Argentina, which should reach Brisbane shortly, contains the Argentine cochineal insect, as well as the fungi, *Sclerotinia* and *Montagnella,* mentioned above, and the moth-borer, *Cactoblastis* (*Zophodia*) *cactorum,* the attempted introduction of which by the Queensland Travelling Commission had been unsuccessful.

The laboratory has also received some wild cochineal, *Coccus tomentosus,* from California. It is apparently the same as the Texan form recently received and has attacked three Queensland prickly pears : the common prickly pear, the spiny pear of the Burnett and Rockhampton districts, and the tree pear (*O. tomentosa*). Up to the

present its effects have been negligible, as also are those produced by some of the cochineal insects from recent consignments.

Apart from the bacterial disease now being carefully studied, the most important enemy received seems to be *Melitara prodenialis*. The South American *Zophodia* should have a similar effect. The larvae of these moths bore into the joints and feed there. The Queensland prickly pears are readily attacked by these borers, which—like all the other insects mentioned here—restrict themselves to cactaceous plants. Until the hibernating larvae of *Melitara* breed, it will not be possible to know whether the importation has been successful.

The bugs (*Chelinidea*), weevils (*Gerstaeckeria*) and cochineal insects all appear to be breeding satisfactorily. Though scavenging flies emerged in large numbers from the Florida and Texan material, nearly all have died, and none have bred. Extreme care was taken in Texas and Florida to eliminate all parasitic or predatory insects detrimental to the organisms that have been imported into Queensland. The South American fungi have not responded well to the cultural methods; in Argentina they are very effective.

In this attack on the prickly-pear pest the author is endeavouring to utilise organisms acting in various ways :—(1) Insects that actually eat the plant (*e.g.*, moth-borers, weevils, etc.); (2) insects that suck the juices, either weakening or poisoning the plant (cactus bugs, cochineal insects); (3) insects that attack the fruit (*e.g.*, certain midges, *Cecidomyia* (*Itonida*), *Asphondylia*, not yet imported); (4) insects, such as scavenging flies, that continue destructive work such as is done by those of the first group and passively assist the introduction of saprophytic fungi and bacteria; (5) actual disease-producing agents, such as fungi and bacteria.

Such of the organisms established in the laboratory as appear unlikely to threaten economic plants will be studied in the field in prickly-pear centres and then distributed if satisfactory.

It is perhaps unwise to expect that the new arrivals will be so destructive to the Queensland prickly pear as the Indian cochineal insect has been to *O. monacantha*, but it is hoped that they will be sufficiently effective to leave only a remnant of the pest that can be dealt with without difficulty.

DODD (A. P.). **A new Grass Pest of the Atherton Tableland.**—*Queensland Agric. Jl., Brisbane*, xvi, no. 2, August 1921, pp. 79–81.

During the drier months of 1920 (July to November) serious damage was done to the pastures of the Atherton tableland by a Hepialid moth, *Oncopera mitocera*, Turner. The other species of this genus, *O. intricata*, is a grass-destroyer common in Victoria and Tasmania. *O. mitocera* appears to be confined to north Queensland, and possibly to the Cairns district.

A brief description is given of the various stages. The moths are on the wing in late March or early April. Early in October the larvae were about two-thirds grown; full-grown and pupating larvae and pupae were found in the first week of March. No larvae and very few pupae were seen in mid-April. It is therefore almost certain that the life-cycle is completed in a year.

The larva constructs a vertical tunnel in the soil from 5 to 16 inches deep. In pastures, but not in the scrub, the tunnels are covered with a mat of webbing and frass. The larva emerges at night to feed on

the grass blades. Underground roots do not appear to be eaten, but the grass seems to die owing to the larva gnawing down to the base from the surface. The pupa rests at the bottom of the tunnel, but works its way to the surface when emergence is about to occur. The moths are not attracted by light sufficiently to suggest trapping.

This species is undoubtedly a native of the scrub, and the change to pastures has favoured its rapid increase. In the worst situations some grasses have been killed in small patches, and in any case the larvae cause a serious depletion of the pastures, which cannot, therefore, carry their full complement of stock. As the damage is chiefly done in the dry months, when good grazing is essential, this is a serious matter. Where the larvae are abundant as many as thirty can be dug up in one cubic foot of soil.

Jumping spiders catch a few moths. Nightjars doubtless destroy many others, but on the tableland there is a marked absence of birds that might be helpful.

Heavy rain, or an excessively wet season, may go far toward restricting their numbers. The month of March 1921 was exceedingly wet, and in April it was found that the coverings of the tunnels had been washed away and many of the mouths of the shafts closed. In one badly infested field dead pupae were found that had failed to break through the soil washed over the opening.

Hutson (J. C.). **Report of the Government Entomologist on his Visit to Batticaloa in connection with the Pests of Coconut Cultivation.**— *Trop. Agric., Peradeniya, Ceylon,* lvii, no. 2, August 1921, pp. 124–130.

Nephantis serinopa (black-headed coconut caterpillar) usually confines its attacks to certain more or less definite areas, where the trees are less vigorous. It rarely spreads to healthy trees. The caterpillars apparently prefer the older leaves to the younger and healthier ones in the crown of the tree. On neglected estates the pest may spread rapidly, and the weaker trees succumb. All infested leaves should be cut off and burnt and the trees maintained in a vigorous condition by good cultivation and judicious manuring in conjunction with sanitary methods. Light traps should be employed to catch the moths as they emerge, before oviposition can take place.

Oryctes rhinoceros (rhinoceros beetle) is quite common in the district. All dead stumps should be destroyed and no other decaying vegetable matter or heaps of manure and animal refuse should be left longer than three months without being covered with sand. Stumps should be removed and split and the cavities in the roots excavated and filled in with sand to a depth of about eight inches. Dead palms should be cut through at soil level.

Rhynchophorus ferrugineus (red weevil) lays its eggs in all palms injured by *Oryctes rhinoceros* or other agencies. Where possible all palms with their top roots and base stem exposed should be protected from attack by surrounding them with a heaped ring of coconut husks and filling the intervening space with soil. To prevent this acting as a breeding-ground for *O. rhinoceros* it should be covered with sand. This method not only proves an effective means of protecting the vulnerable part of the tree, but also improves its general condition.

Mattsson Mårn (L.). **Märgborrens Kronskadegörelse och dess Inverkan på Tallens Tillväxt.** [The Crown Injury done by *Myelophilus piniperda* and its Influence on the Growth of the Pine.]—*Meded. Stat. Skogsförsöksanst., Stockholm,* xviii, no. 1–2, 1921, pp. 81–101, 2 charts. (With a Summary in German.)

The investigations reported here on the influence of *Myelophilus piniperda* on the growth of the pine were made in 1916. Details of the method of estimating the amount of injury caused are given, the conclusions being that the amount of increase in diameter of the trunk is reduced in direct proportion to the injury. The reduction of the increase in the growth of the trunk—as expressed by the area of a horizontal section—is greater than the reduction of the assimilating portion of the tree [*i.e.*, the needles and young shoots], but it is not so great as to make the reduction in the increase of the radius, when expressed in percentages, equal to the reduction in the assimilating portion.

Rodway (J.). **Cane Borers in 1879. Past Efforts of the R.A. & C. Society.**—*Timehri : Jl. R. Agric. & Comm. Soc. British Guiana, Demerara,* vii, 3rd Ser., August 1921, pp. 47–60.

The history of the occurrence of borers in sugar-cane prior to 1879 is reviewed, and many records of resolutions passed and work undertaken in that year are quoted. The borers in question were two weevils, one large and one small, and a moth. *Castnia licus* had apparently not appeared in 1879 ; it was considered a new pest about 1893.

Skaife (S. H.). **On** *Braula caeca,* **Nitzsch, a Dipterous Parasite of the Honey Bee.**—*Trans. R. Soc. S. Africa, Cape Town,* x, pt. 1, 30th August 1921, pp. 41–48, 11 figs.

Braula caeca, Nitzsch, is a common parasite of the honey bee in Africa and elsewhere. It is not pupiparous as was previously thought. The eggs are laid on the brood combs in the hives. The larvae make their way into the cells containing young bee larvae and feed side by side with them on the same food. They also pupate beside the bee pupae, but emerge before the latter and immediately make their way on to the body of their host. The adults apparently feed on honey. These insects rarely become abundant in strong hives, but in weak colonies there is hardly an individual bee to be found without one or more of these parasites.

Barbey (A.). **Contribution à l'Étude des Cerambycides xylophages,** *Aegosoma scabricorne,* **Scop.**—*Bull. Soc. Vaud. Sci. Nat. Lausanne,* liv, no. 200, 16th September 1921, p. 26.

The Cerambycid, *Aegosoma scabricorne,* Scop., has been recorded from many trees, especially limes. The eggs are laid in decomposing wood, and the larval stage lasts from two to three years, during which period winding galleries are bored and more or less filled with sawdust. Pupation occurs in June, and the adults emerge three weeks later. Woodpeckers are among the chief natural enemies, but they are unable to reduce the pest materially as hundreds of borers may be found in one trunk.

Headlee (T. J.). **Dusting v. Spraying for Insect Control.**—*Trans. Peninsula Hortic. Soc.* [*Delaware*], xxxiv, 1921, pp. 51–60, 1 fig. (Abstract in *Expt. Sta. Record, Washington, D.C.*, xlv, no. 2, August 1921, p. 137.)

This paper records experiences of dusting and spraying for the control of insect pests in New Jersey during 1919 and 1920. A chart illustrates the relation of rainfall in these years to the time of application of dusts and the periods during which such applications must remain on the tree to be effective. Heavy rains were found to wash off the dust promptly and light rains to be harmful when extending over a long period. A marked correlation existed between the presence or absence of heavy rains and the number of larvae of the codling moth [*Cydia pomonella*].

The author concludes in part that the best that can be claimed for the dust under most favourable average conditions is that it is about as good as the spray. In New Jersey the evidence in favour of greater efficiency on the part of the liquid materials is clear and definite for control of curculio [*Conotrachelus nenuphar*] and codling moth.

Rohwer (S. A.). **Notes on Sawflies, with Descriptions of new Genera and Species.**—*Proc. U.S. Nat. Mus., Washington, D.C.*, lix, no. 2361, 1921, pp. 83–109.

The new species of sawflies described include *Xiphydria champlaini* reared from wood of *Carpinus caroliniana* from Pennsylvania, *X. heritierae* reared from sundri (*Heritiera fomes*) from Bengal, *Neodiprion eximina* reared from larvae collected on *Pinus resinosa* in Wisconsin, and *Senoclia dioscoreae* on *Dioscorea* from India.

Viereck (H. L.). **First Supplement to "Type Species of the Genera of Ichneumon-flies."**—*Proc. U.S. Nat. Mus., Washington, D.C.*, lix, no. 2364, 1921, pp. 129–150.

This supplement completes the author's review of the literature on the Ichneumonoidea [*R. A.E.*, A, ii, 182] up to the end of 1919.

Weld (L. H.). **American Gallflies of the Family Cynipidae producing Subterranean Galls on Oak.**—*Proc. U.S. Nat. Mus., Washington, D.C.*, lix, no. 2368, 1921, pp. 187–246, 10 plates.

The object of this paper is to bring together the scattered existing information with regard to the American Cynipids forming root-galls on oaks. Twenty-three new species are added to the seven previously described, and several changes are made in the synonymy.

It is thought that further study of the relationships of the gall-making Cynipids to their foodplants will throw light on the affinities of the species of oak. Whereas some Cynipids attack many oaks, others confine themselves to a single species ; thus one species dealt with attacks at least ten species of the red oak group and probably more, whilst one Californian oak is attacked by over forty different Cynipids that are never found on any other oak in that region, although some of them have occurred on a rare oak in southern Arizona and on an oak in the Channel Islands. This is considered to afford evidence of the close relationship of these local and isolated oaks. There is one American oak on which no Cynipid galls have yet been found.

DUDLEY (F. H.). **Report of the State Horticulturist.**—*19th Ann. Rept. Maine Commiss. Agric. 1920, Augusta,* 1921, pp. 26–49, 3 figs. [Received 1st October 1921.]

The situation as regards gipsy moth [*Porthetria dispar*] in Maine is very serious. It is impossible for the State to make suitable appropriations for dealing with this pest, but with the assistance of the towns and cities in the infested area a great deal may be done towards eradication. Other noxious insects recorded include the raspberry cane borer [*Oberea bimaculata*], which may be controlled by cutting and binding infected tips below the girdled point and cutting down affected canes in the late summer before the larvae enter the base for hibernation. Leafhoppers, *Empoasca mali, E. unicolor* and *Empoa* (*E.*) *rosae* caused considerable damage in orchards. *E. rosae* may be controlled by removing currant and gooseberry bushes (on which it passes the winter) from infested orchards. Spraying with kerosene emulsion or nicotine sulphate, 5–12 U.S. pints to 40 U.S. galls. of water, with the addition of 2 lb. of soap to soft water and 4 lb. to hard, is effective against all leafhoppers. Soap should not be used if nicotine sulphate is added to lime-sulphur solution.

Against the European corn borer (*Pyrausta nubilalis*) a general campaign is considered necessary. It is suggested that maize-growing in infested areas should not be curtailed, but that planting within the quarantined districts should be limited to such areas as the farmers themselves can deal with by destroying weeds and stubble and putting maize fodder in silos.

Deep ploughing in late autumn is advocated against *Heliothis obsoleta* (corn ear worm). *Papaipema nebris* (*nitela*) (common corn stalk borer), though less abundant than in the previous year, has caused considerable damage ; grass adjoining maize fields should be mown and promptly removed as fodder or burnt. Many beneficial insects are also recorded [*R.A.E.*, A, viii, 529].

CONNER (A. B.). [**Entomological Work.**]—*33rd Ann. Rept. Texas Agric. Expt. Sta., College Station,* 1920, pp. 18–22, 1 fig. [Received 1st October 1921.]

A brief account is given of the measures against various insect pests during 1920, many of which have already been noticed [*R.A.E.*, A, viii, 501 ; ix, 350, 425]. Burning sulphur in the fields at night proved useless in the control of *Anthonomus grandis*.

Cultural practices such as rotation, or the planting of potatoes in uninfested land and the use of uninfested slips, will greatly reduce the losses due to the sweet potato weevil [*Cylas formicarius*].

As a result of the enforcement of the foul-brood eradication law, this disease of honey bees has been greatly reduced throughout the State. Of 25,676 colonies inspected less than 4 per cent. were found to be infected.

Department of Entomology.—*Ann. Rept. Virginia Poly. Inst. Agric. Expt. Sta., 1918–1919, Blacksburg,* 1920, pp. 25–26. [Received 1st October 1921.]

No practical method of eradicating woolly aphis [*Eriosoma lanigerum*] from infested trees has been found. Infestation is particularly noticeable on young apple trees in nurseries and orchards. The oriental

peach moth [*Cydia molesta*] is not definitely known to occur in the State outside of the northern counties within a radius of 50 miles of Washington City.

Smulyan (M. T.). **The Rosy Apple Aphis** (*Aphis malifoliae*, **Fitch**).—*Ann. Rept. Virginia Poly. Inst. Agric. Expt. Sta., 1918–1919, Blacksburg,* 1920, pp. 38–64, 3 figs. [Received 1st October 1921.]

Of the three Aphids attacking apples in Virginia, *Aphis prunifoliae*, Fitch (apple grain aphis), *A. pomi*, De G. (green apple aphis) and *A. malifoliae*, Fitch (rosy apple aphis), the latter is the most injurious. It apparently occurs wherever apple trees are grown. A key is given to distinguish the first instar stem-mothers of the three species [*R.A.E.*, A, vi, 298], and descriptions are also given of all the stages of *A. malifoliae*.

The life-history as occurring in Virginia at a comparatively high altitude—2,400 feet—is described [*cf.* *R.A.E.*, A, iv, 340; v, 50], and details are given of the length of life in each individual stage. The natural enemies of *A. malifoliae* include the Hymenopterous parasites, *Lysiphlebus testaceipes*, Cress., *Ceraphron* sp., *Asaphes americana*, Gir., *Propachyneuronia siphonophorae*, Ashm., *Pachyneuron* spp., *P. virginicum*, Gir., *Aphidius phorodontis*, Ashm., *Lygocerus stegmatus*, Say, *Tetrastichodes detrimentosus*, Gahan; the Coccinellids, *Adalia bipunctata*, L., *Cycloneda munda*, Say, *Hippodamia convergens*, Guér., *Coccinella novemnotata*, Hbst., *Psyllobora vigintimaculata*, Say, *Anatis quindecimpunctata*, Oliv., *Megilla fuscilabris*, Muls., *Chilocorus bivulnerus*, Muls., *Scymnus collaris*, Muls.; a Dipterous parasite, *Leucopis griseola*, Fall.; and *Chrysopa* sp.

During 1916 experiments were carried on to test the value of a single spraying with nicotine sulphate, 40 per cent., at the rate of $\frac{3}{4}$ U.S. pint in 100 U.S. gals. of water with the addition of 3–5 lb. of soap applied at the time the buds showed green, or of a single spraying with nicotine at the same rate in the dilute lime-sulphur at the time the blossom buds showed pink, or with both treatments combined. Of the effect of these sprays on *A. malifoliae* very little can be said, but *A. prunifoliae* may be controlled by one application of nicotine sulphate (40 per cent.) in water (1 to about 1,000) and soap (4 lb. to 100 U.S. gals.), about the time the green buds begin to unfold and the Aphids are all hatched. There is apparently no advantage in applying later sprays of nicotine sulphate in lime-sulphur. Subsequent experiments confirm these observations. *A. prunifoliae* does not affect the yield or quality of the fruit, and may therefore be regarded under normal conditions as causing little if any injury to apples. The preference shown by it for flowers and flower-clusters may, however, make it an important factor in the dissemination of fire blight (*Bacillus amylovorus*).

Chittenden (F. H.). **The European Horse-radish Webworm.**—*U.S. Dept. Agric., Washington, D.C.,* Bull. 966, 25th August 1921, 10 pp., 8 figs. [Received 1st October 1921.]

Evergestis straminalis, Hb. (European horse-radish webworm) occurs in the northern United States on horse-radish and less often on turnips and cabbage. The various stages are described. Hibernation occurs in the larval stage in the pupal cell near the surface of the ground. The moths appear about May. The eggs, laid in masses

containing from 6 to 20, hatch in about a week. The larvae feed on the leaves, at first in colonies but later scattered throughout the field. They generally feed near the midrib and near the middle of the plant. When very abundant, they also attack the stalks. They pupate after about three weeks, and the moths appear three weeks later, giving an approximate life-cycle of from seven to eight weeks. At least two generations a year occur in Virginia.

In Europe *E. straminalis* has been recorded as feeding in confinement on wild plants of the genera *Barbarea, Sinapis* and *Cardamine*. Two years study in the district of Columbia has only revealed one parasite, *Bracon montrealensis*, Morr., which attacks the larvae. Lead arsenates and lime and zinc arsenite will probably be of equal value against this pest when used for other caterpillars on cabbage, but as the larvae often feed near the base of the plant, spraying under the leaves is essential. For slight infestations handpicking is advocated. Autumn and spring ploughing is suggested for the destruction of pupal cases when the moth occurs on horse-radish, but if the latter is planted in beds, sprays will have to be employed in cases of severe infestation.

Smyth (E. G.). **Plant Inspection and Quarantine Report (1918–19).**—*Porto Rico Insular Expt. Sta., Rio Piedras,* Bull. 23, September 1919, pp. 5–56, 20 tables. [Received 1st October 1921.]

This paper is a résumé of plant quarantine work in Porto Rico from 1910 to 1919. The plants, fruits and seeds inspected and the insects intercepted in each of these years are tabulated.

Catoni (L. A.). **Plant Inspection and Quarantine Report (1919–20).**—*Porto Rico Insular Expt. Sta., Rio Piedras,* Bull. 27, 1921, 23 pp. 4 tables.

A description is given of the setting up in 1919 of a Technical Board to supervise Plant Quarantine and Inspection. In January, boll-weevils [*Anthonomus grandis*] were found in some unlawfully imported cotton seed, but there was no trace of the pest in the area planted before inspection.

No quarantine is to be established against cotton products [*R.A.E.*, A, ix, 313, 399] until it is proved that fumigation with hydrocyanic acid gas, as practised at the port of New York, is ineffective against the cotton leaf-blister mite (*Eriophyes gossypii*).

The following pests have been intercepted :—From Spain, *Bruchus pisorum* in Lima beans and in peas, *Calandra oryzae* in beans and maize. From New York, Philadelphia and Ohio, *Pseudococcus* on potatoes, *Chrysanthemum, Dracaena, Dahlia,* and *Saxifraga sarmentosa.* From South Carolina, *Anthonomus grandis* in cotton seed. From the Virgin Islands, *Aspidiotus hartii* on yams, tannias and grass. From San Domingo, *Bruchus* sp. in beans and maize. From Guadeloupe, *Bruchus* sp. in seeds.

Matz (J.). **Citrus and Pineapple Fruit Rots.**—*Porto Rico Insular Expt. Sta., Rio Piedras,* Bull. 24, September 1920, 12 pp., 3 figs., 3 tables. [Received 1st October 1921.]

Various fruit rots of *Citrus* and pineapples are discussed. The puncturing of pineapples by mealy bugs (*Pseudococcus bromeliae*) is often responsible for the spread of fungus diseases.

SMYTH (E. G.). **The White Grubs injuring Sugar Cane in Porto Rico. II. The Rhinoceros Beetles.**—*Jl. Dept. Agric. Porto Rico, San Juan, P.R.*, iv, no. 2, April 1920, pp. 3–29, 4 plates. [Received 1st October 1921.]

This paper is the third of a series [*cf.* *R.A.E.*, A, v, 410, 558].

The larvae of *Strategus titanus* feed on organic matter in the soil. Such damage as severing underground stalks is accidental, and attacks are only serious if the beetle is abundant and the sugar-cane is suffering from drought and inadequate manuring. The adults cause no direct injury and only occasionally bore into the base of the stool for oviposition. It is difficult to determine the injury this beetle causes to crops, as *Lachnosterna* (*Phyllophaga*) and *Diaprepes*, which are less likely to be observed on examination, are almost always present with it.

It is abundant in the humid districts of Porto Rico. Decaying forest trees and stumps are its natural habitat, but as the result of timber clearing, it has become a sugar-cane pest. The eggs are laid singly in torn fibre or inside cane stalks. The average length of the egg stage is 17½ days, and that of the larval stage 10 months. The larvae usually attack rotted stems, and living ones are only infested if the pest is abundant. In the prepupal stage they are especially susceptible to the attacks of fungi. The pupal stage averages 24 days. Natural enemies include the mongoose, the Porto Rican blackbird (*Holoquiscalus brachypterus*), and various species of mites, of which one infests the adults and another destroys the eggs. A bacterium (*Micrococcus nigrofaciens*) is often fatal to the larvae, and the green muscardine fungus (*Metarrhizium anisopliae*) virulently attacks all stages, of which the pupal is the most, and the egg the least, susceptible.

Remedial measures recommended are the ploughing up of old canes and the destruction of any larvae. Excess of organic fertilisation should be avoided in fields subject to attack, and dead cane stubble and dry stalks should be burned after ploughing. A poison bait consisting of 2 lb. white arsenic (arsenic trioxide) or Paris green, or 4–5 lb. lead, calcium or zinc arsenates mixed into 100 lb. of manure or bagasse, which may be distributed round newly planted cane or spread broadcast before the final ploughing, kills many larvae and affords protection against hard-backs [*Lachnosterna*]. Manure heaps placed at intervals along cane-field borders may serve as traps, provided that they are regularly examined and the beetles found in them destroyed.

Strategus quadrifoveatus, P. de B., is only a minor sugar-cane pest, but causes more damage to coconut plantations. The average life-cycle lasts 14 months. The larva feeds on decayed wood and coconut fibre round the base of old stumps. The adult feeds on the succulent tissues of woody plants and trees and bores into coconut palms from the level of the ground, thus differing from *Oryctes rhinoceros*, which enters the stem high up among the leaves.

The natural enemies are the same as those of *S. titanus*. A mite, *Tyroglyphus heteromorphus*, has been found on larvae collected in rotten palm trees. Young coconut palms should be protected against attack by treating the nuts and husks before planting with strong repellents such as carbolineum or crude petroleum. The beetles should be caught and killed when flying at dusk in the groves. Such breeding places as decayed logs and stumps should be burned, but if accumulated into piles will form traps, provided that they are

regularly examined for larvae. Many larvae may be killed by liberally sprinkling coconut husks piled about the bases of palms with 2 lb. Paris green to 100 U.S. gals. water.

Ríos (P. G.). **Cultivo del Banano en Puerto Rico.**—*Porto Rico Insular Expt. Sta., Rio Piedras*, Bull. 25, September 1920, 30 pp., 10 figs. [Received 1st October 1921.]

The cultivation of the banana, which is an important article of diet among the poor in Porto Rico, as well as the basis of a flourishing industry, is not seriously affected by insect pests. The principal damage is done by white grubs, *Lachnosterna* (*Phyllophaga*) spp., from May to September. The adults are nocturnal in habit and devour the foliage. Eggs are laid on the trunk of the plant, and the larvae attack the roots. Birds and other predators devour the grubs ; for the adults, hand collection or light-traps are the best remedies. *Diaprepes* sp. has been observed eating the young leaves at the crown of the plant ; the damage, however, is slight. Aphids are sometimes troublesome on banana plants, attacking plantains for preference.

Burgess (A. F.). **The Satin Moth: an introduced Enemy of Poplars and Willows.**—*U.S. Dept. Agric., Washington, D.C.*, Dept. Circ. 167, May 1921, 16 pp., 6 figs. [Received 3rd October 1921.]

Stilpnotia salicis, L. (satin moth), which is a well-known pest in Europe, was first discovered on poplar trees in the United States about July 1920 [*R. A. E.*, A, viii, 464]. As the insect is closely related to the gipsy moth [*Porthetria dispar*] and the brown-tail moth [*Nygmia phaeorrhoea*], considerable anxiety was felt as to the damage it might cause, and studies were made of its habits. Oviposition occurs about the middle of July, the eggs being laid in masses, generally on the lower surfaces of the leaves and on the branches and trunks of the trees, and sometimes also on grass, weeds or stones, or even on the ground. Oviposition continues for about a month, each female producing some 550 eggs. Larvae appear within 15 days, and after two moults construct a silken web in some crevice or irregularity of the bark, in which one, and sometimes two or three larvae hibernate. The hibernation chambers are covered over and are very difficult to detect ; they have been found high in the trees on small twigs and attached to the scars where leaves have fallen. The newly hatched larvae feed on the epidermis on both sides of the leaf ; in cases of severe infestation most of the foliage may be devoured, so that only the ribs and framework remain. Various species of poplar were preferred by the young larvae, though willow was also attacked in laboratory experiments. Alder, apple, grey birch, elm, red oak and white oak were not attacked, but a few larvae survived on black oak foliage ; this may prove an important food-plant, as it is rather common in some parts of New England. It is probable that the larvae that have hibernated emerge from their webs as soon as sufficient foliage is available and feed again, and, after passing through several moults, become full-grown about 1st July. When feeding is completed, generally towards July, they spin loose cocoons and pupate, either in leaves of which they have drawn together the edges, in crevices of the bark, in rubbish near the base of the tree or on the sides of buildings. Pupation occupies about nine days, and the first moth was observed on 2nd July.

As a result of thorough scouting operations, this insect is now known to occur over an area of 642 square miles, including 60 towns in Massachusetts and four in New Hampshire. The infested areas are shown in a map. Large larvae or pupae were found in many districts, showing that these areas were infested in the previous year. The trend of spread has been towards the north and north-east, due doubtless to the direction of the prevailing wind at the time the moths are on the wing. The insect has in all probability been present in the United States for several years, but has only been abundant enough to spread rapidly during the last two or three years.

Field observations have shown that the larvae are attacked by the imported Carabid beetle, *Calosoma sycophanta*, L., and extensively parasitised by the Tachinid, *Compsilura concinnata*, Meig. A small Hymenopterous parasite reared from the eggs has been identified as *Telenomus californicus*, Ashm. The prospect of control of *S. salicis* by parasites is encouraging, but it may be necessary to introduce some of its enemies from Europe.

The most satisfactory remedies can only be determined by time. Treating the egg-masses with creosote is effective, but is expensive, and impracticable in cases where they are deposited on small branches and on leaves. It is suggested that poplars and willows should be sprayed, as soon as they are in full leaf, with 10 lb. lead arsenate to 100 U.S. gals. of water, using soft soap as an adhesive. If the infestation is severe, this should be repeated about mid-June, and again, if necessary, about 1st August.

If infestation is confined to poplars and willows, the damage will not be of very great importance, although these trees are of economic value, but if other trees such as oak (which is said to be attacked in Europe) become infested, the problem will be much more serious. A careful watch should be maintained for new areas of infestation, and all favoured food-plants should be carefully inspected during July and August.

Packard (C. M.) & Thompson (B. G.). **The Range Crane-flies in California.**—*U.S. Dept. Agric., Washington, D.C.* Dept. Circ. 172, May 1921, 8 pp., 5 figs. [Received 3rd October 1921.]

Ranges, pastures, and grain and lucerne fields in California are frequently badly injured during the rainy season by the larvae of *Tipula simplex*, Doane, and *T. quaylei*, Doane. The damage is generally most severe during wet winters, though local infestations occur every year, many hundred pounds' worth of forage being destroyed during a heavy infestation.

Eggs are laid in the winter in depressions in the soil, under loose stones, among grass roots, etc., where they remain dormant during the dry season and hatch in the following winter as soon as they are soaked by the first rains. Each female of *T. simplex* may lay about 100 eggs. The stages of the fly are described. The newly hatched larvae appear when the grasses are beginning to sprout after the early rains, and at first the effect of their feeding is not noticeable, but by January they frequently devour all available pasture. In late January or early February they become full-grown, cease to feed, and pupate just below the ground surface. The adults appear in late February or March, and there is only one generation in a year. The females are wingless, and lay their eggs within a short distance of the spot

where they emerge. The life-history and habits of *T. quaylei* are very similar, but the adults of both sexes are wingless.

Remedial measures have hitherto been confined to constant cultivation ; this method can only forestall future injury and cannot be applied to large areas of range land. For land that is actually infested a poisoned-bran bait should be evenly scattered about in the evening. The usual bait for grasshoppers killed an average of 72 per cent. of larvae present ; a cheaper and equally effective bait consists of 25 lb. bran, 1 lb. Paris green and about 3 U S. gals. water in order to make a flaky mash, 10 to 20 lb. per acre being the smallest quantity required to produce a uniformly high mortality over the entire area.

McIndoo (N. E.), Simanton (F. L.), Plank (H. K.) & Fiske (R. J.). **Effects of Nicotine Sulphate as an Ovicide and Larvicide on the Codling Moth and three other Insects.**—*U.S. Dept. Agric., Washington, D.C.*, Bull. 938, 17th May 1921, 19 pp. [Received 3rd October 1921.]

Nicotine sulphate, 40 per cent., is effective in destroying the fresh eggs of *Bombyx mori*, L. ; in older eggs hatching is more or less retarded by it. The exhalation from leaves dipped in the solution one to five days previously proved fatal to newly hatched larvae, and when fed on the leaves six to eleven days after dipping, they also succumbed.

Against eggs of the codling moth [*Cydia pomonella*] nicotine sulphate did not prove effective, only about 20 per cent. of the eggs failing to hatch. Larvae placed on pears that had been sprayed one or two days previously were reduced by about 75 per cent., the mortality decreasing to about 25 per cent. on the sixth and seventh days. Similar experiments carried out with eggs of *Leptinotarsa decemlineata*, L. (potato beetle) and *Hemerocampa leucostigma*, S. & A. (tussock moth) proved the inefficacy of nicotine sulphate as an ovicide in the case of these species.

Field experiments show that nicotine sulphate, 1 : 800, with soap, is fairly efficacious against the larvae of *Cydia pomonella*, but it is inferior in action to a spray of 1 lb. powdered lead arsenate to 50 U.S. gals. water. There is apparently no advantage in combining nicotine sulphate and lead arsenate against this pest.

Kotinsky (J.). **Insects injurious to Deciduous Shade Trees and their Control.**—*U.S. Dept. Agric., Washington, D.C.*, Farmers' Bull. 1169, June 1921, 100 pp., 64 figs. [Received 3rd October 1921.]

The factors associated with the control of insect pests of shade-trees are discussed, and an account is given of both natural enemies and artificial remedial measures. Spraying machinery and accessories with spray formulae, and the usual remedial measures such as pruning and banding are described.

The various pests are dealt with besides many mentioned in a previous paper [*R.A.E.*, A, viii, 247] include the Lepidoptera, *Ceratomia catalpae*, Bdv., *Malacosoma disstria*, Hb., *Palaeacrita vernata*, Peck., *Alsophila pometaria*, Harr., *Anisota rubicunda*, F., *Apatela populi*, Riley, *Euvanessa antiopa*, L., *Chlorippe celtis*, Bdv., and *C. clyton*, Bdv. ; the sawfly, *Cimbex americana*, Leach ; the Coleopterous borers, *Saperda tridentata*, Ol., *S. vestita*, Say, *S. calcarata*, Say, *Parandra*

brunnea, F., *Cryptorrhynchus lapathi*, L., and *Plectrodera scalator*, F., and the twig-girdlers, *Oncideres cingulata*, Say, *O. texana*, Horn, and *O. putator*, Thom.; the Rhynchota, *Corythuca ciliata*, Say, and *Leptocoris trivittatus*, Say; the scales, *Chrysomphalus tenebricosus*, Comst., *C. obscurus*, Comst., *Kermes pubescens*, Bogue, *Neolecanium cornuparvum*, Thro., *Eulecanium* (*Lecanium*) *nigrofasciatum*, Perg., and *Gossyparia spuria*, Mod.; and the Aphids, *Periphyllus lyropictus*, Kess., *P. negundinis*, Thos., *Macrosiphum liriodendri*, Mon., *Prociphilus tessellatus*, Fitch, *P. imbricator*, Fitch, and *Phyllaphis fagi*, L. Gall-making insects include *Eriosoma rileyi*, Thos., *Pemphigus populi-transversus*, Riley, and many other Aphids, Cecidomyiids and Psyllids.

A list is appended of shade-tree pests arranged according to the food-plant and manner of attack.

Craighead (F. C.) & Hofer (G.). **Protection of Mesquite Cordwood and Posts from Borers.**—*U.S. Dept. Agric., Washington, D.C.*, Farmers' Bull. 1197, May 1921, 12 pp., 17 figs. [Received 3rd October 1921.]

Mesquite [*Prosopis*] which in many parts of the south-west is the only available wood for general use, is subject to attack by various borers. Those occurring in the vicinity of Tucson, Arizona, are:—*Cyllene antennatus*, White (round-headed borer), *Apatides fortis*, Lec., *Dendrobiella aspera*, Lec., *Xylobiops* sp. and *Chrysobothris octocola*, Lec.

A. fortis prefers wood that had been dry for several months, but the other borers show a decided preference for freshly cut wood for oviposition. The safest period for cutting the timber is from the middle of October to the end of November; it should not be stored longer than a year. Where it is essential to cut the wood between March and October, it should be laid on the ground in the sun and turned at least twice, at intervals of about two weeks. Two turns in six weeks are sufficient to kill the larvae or prevent attack, but this method can only be used effectively between 1st April and 1st October. Wood cut between October and January and loosely stacked so that it dries quickly is usually little injured. These methods may also be applied against *Cyllene crinicornis*, Chev., and *Xylobiops* spp. occurring in Texas.

Luginbill (P.) & Beyer (A. H.). **Corn Earworm as an Enemy of Vetch.**—*U.S. Dept. Agric., Washington, D.C.*, Farmers' Bull. 1206, June 1921, 19 pp., 13 figs. [Received 3rd October 1921.]

The corn earworm [*Heliothis obsoleta*] is one of the worst pests of vetch in the south Atlantic States. Remedial measures include spraying with 1 lb. lead arsenate (powder form) to 50 U.S. gals. water, and dusting with lead arsenate, 1 lb. Paris green with 3 lb. freshly slaked lime, or calcium arsenate. The latter may be used undiluted if it contains not more than $\frac{3}{4}$ per cent. water-soluble arsenic; otherwise it should be diluted with lime. Poison baits, consisting of 50 lb. wheat bran, 1 lb. Paris green or white arsenic, 2 U.S. gals. cheap molasses, 3 to 4 U.S. gals. water and 6 chopped oranges or lemons, are also effective [*cf. R.A.E.*, A, vii, 105.]

The chief parasite of *H. obsoleta* on vetch is the Tachinid, *Winthemia quadripustulata*; but it is also destroyed by various birds, including domestic fowls. Toads are commonly found in infested vetch fields, and devour a large number of the caterpillars.

Uichanco (L. B.). **Reproduction in the Aphididae, with a Consideration of the modifying Influence of Environmental Factors.**—*Psyche, Boston, Mass.*, xxviii, no. 4, August 1921, pp. 95–109. [Received 3rd October 1921.]

Parthenogenesis in Aphids is apparently continuous under favourable conditions, and it has practically supplanted amphigony, in which both sexes are concerned. The latter occurs only under the influence of low temperatures, and according to some authors, as the result of an inadequate food-supply. If the quantity of food has any influence at all on the determination of amphigony in a parthenogenetic mother, the effect does not become manifest in the immediate offspring. In certain species the amphigonous generation continues to occur at definite cyclical intervals for some time after the influence of low temperature has been eliminated. In colder climates Aphids undergo a change in the method of reproduction as an adaptation to adverse environmental conditions, but the relation of food to this phenomenon is not definitely known.

Departmental Activities; Entomology.—*Jl. Dept. Agric. Union S. Africa, Pretoria*, iii, no. 3, September 1921, pp. 208–210.

Attention is again drawn to the permits that are necessary in respect of importations of cotton seed. Permits are only given for seed to be sown, and then only to the extent of 10 lb. of a variety to any one applicant. The importance of these restrictions has been indicated several times in the past year by the finding of the pink bollworm [*Platyedra gossypiella*] in small parcels of North African seed, and, during the past month, by the presence of a few dead adults of the Mexican boll weevil (*Anthonomus grandis*) in a parcel of seed from the United States.

Aloes in Pretoria have been damaged for several seasons by the weevils, *Brachycerus interstitialis*, Fhs., and *B. monachus*, Fhs. Their life-histories have not been fully worked out; they appear to lay eggs in the crown of the aloe plant, and the larvae descend the leaves into the stem. If the terminal bud is injured, the plant may die and rot away. The adults also eat out irregular patches of the leaves. A smaller species, *Mecistocerus aloës*, Mshl., occurs in numbers in the crown of the plant, where the adults gnaw out circular cavities in the young leaves, leaving only the surface membrane. All three species are very difficult to deal with owing to the protected habitat of the larvae; the only effective measures seem to be the cutting out of the grubs from infested plants and hand-collection of the adult beetles.

Plum-trees in Pretoria and various other localities in the Transvaal are frequently defoliated by the caterpillars of *Parasa latistriga*; other cultivated plants are attacked and sometimes oak trees. The oval cases in which they hibernate and eventually pupate are easily found, and crushing them is often the simplest way of destroying the insect.

Mally (C. W.). **Insect Pests. A Factor in Green Manuring.**—*Jl. Dept. Agric. Union S. Africa, Pretoria*, iii, no. 3, September 1921, pp. 219–224, 4 figs.

Green manuring is an excellent method of improving the condition of the soil, but is unfortunately frequently followed by invasions of insect pests which may cause serious loss in fruit orchards or other

cultivated areas that have been so treated. To save orchard trees from such an invasion of *Heliothis* (*Chloridea*) *obsoleta*, tanglefoot may be applied to paper bands tacked round the trees. These should be placed in position just before ploughing the green crop under. The vegetation should be well covered in ploughing to prevent as many insects as possible from escaping. If ploughing can be followed by heavy rolling, it would ensure the crushing of many caterpillars, as well as the quick rotting of the vegetation, which is important in a dry season. Where young crops are to follow green manuring, cutworms are likely to be troublesome, and poison bait should be scattered just before the young crops appear.

PETTEY (F. W.). **The Spraying of Fruit Trees.**—*Jl. Dept. Agric. Union S. Africa, Pretoria,* iii, no. 3, September 1921, pp. 264–270.

The pests that fruit-growers in the coastal regions of South Africa have to deal with each year in the apple and pear orchards include red spider [*Tetranychus*], red scale (*Chrysomphalus aurantii*), codling-moth [*Cydia pomonella*] and the fungus, *Fusicladium.*

C. aurantii, besides infesting pears and apples, also attacks oranges, lemons, roses, grapes (generally only when growing in shade), oaks, willows and olives. The more resistant and susceptible varieties of pears are enumerated. Pear and apple orchards should not be planted near oak or willow trees, which may be possible sources of infestation. The life-history and habits of this scale are described. Young individuals, which appear in late spring, show a decided tendency to migrate to the fruit, and therefore the fruit of susceptible varieties of pears that blossom late escape a considerable number of the migrating young. The effect of infestation is to deform and disfigure the fruit.

Experiments indicate that *C. aurantii* cannot be effectively controlled by one winter spray of lime-sulphur at the usual strength of "Capex" 1 : 10, or about 4° Bé., but that, in addition to the winter application, three foliage sprays of 1 : 40 strength (about 1° Bé.), are advisable. "Capex" should, however, be used with caution in the inland regions, where the spring is dry and hot, as it is likely to scorch the foliage. Should *Fusicladium* not be present, but only scale-insects, red spider, or both, no lime-sulphur should be applied, but only one application of miscible oil, as late in the winter as possible, but before the buds open. The relative merits of home-made concentrated lime-sulphur and the commercial varieties are discussed, and a chart for diluting the sprays is given, with a formula for home-boiled lime-sulphur foliage sprays. A spray chart for pears and apples in the Western Province is given, with instructions as to the best sprays to use under various conditions of infestation.

In orchards infested with *C. pomonella,* the fruit should be thinned in early summer and all infested fruit removed. Infested fruit that has dropped should be removed daily, especially from January to to March, and either used as food for stock, buried deeply or submerged in water.

FULLER (C.). **The Termites of South Africa: being a Preliminary Notice.**—*S. African Jl. Nat. Hist., Pretoria,* iii, no. 1, June 1921, pp. 14–52. [Received 12th October 1921.]

This paper includes the termites of South Africa recorded from south of latitude 22°. The keys given are intended more for the

field-naturalist than the systematist. The synonymy of certain species is discussed at length.

Owing to the great disagreement upon the fundamental points of a classification, and even the status of genera and subgenera, the author has adopted the group system. The termites dealt with belong to ten groups and twenty-one genera, and include the following new species :— *Calotermes braunsi* from the Cape south coast ; *Cryptotermes merwei* from the Natal coast ; *C. pseudobrevis* from Durban, localised in the centre of the town, where it infests wood-work ; *Hodotermes peringueyi* from Albany, etc. ; *H. thomseni* from the Great Karroo ; *H. silvestrii* ranging from van Rhynsdorp to the Orange River ; *H. faurei* from Victoria West ; *H. pallidus*, for which a new subgenus, *Macrohodotermes*, is erected, from the Cape Province ; and *Schedorhinotermes putorius australis*, subsp. n.

Platt (E. E.). **List of Foodplants of some South African Lepidopterous Larvae.**—*S. African Jl. Nat. Hist., Pretoria*, iii, no. 1, June 1921, pp. 65–138. [Received 12th October 1921.]

Separate lists are given under the food-plants and under the insects concerned.

Ballard (E.) & Ramachandra Rao (Y.). **Some Notes on** *Natada nararia*, **Moore.**—*Sine loco*, n.d., 6 pp. [Received 5th October 1921.]

This paper contains detailed notes on the life-history of *Natada nararia*, the caterpillars of which were found defoliating a hedge of *Pithecolobium dulce*. The eggs are laid singly on both sides of the leaves and hatch in about five days, the larval period lasting thirty-one days and the pupal fourteen. The average life of the adult moths in the laboratory was five days. The larvae are parasitised by an unidentified Braconid.

Ramakrishna Ayyar (T. V.), Muliyil (J. A.) & Susainathan (P.). **A Preliminary Investigation of the "Pollu" Disease of Pepper in North Malabar in 1918.**—*Sine loco*, n.d., 14 pp. [Received 5th October 1921.]

The bulk of the information contained in this paper on the life-history of *Longitarsus nigripennis*, Mot., and the relation of this flea-beetle to "pollu" disease of pepper in North Malabar has already been noticed [*R. A.E.*, A, ix, 214]. Further remedial measures include the clipping and destruction of portions of spikes which show distinct attacks. Reduction of shade may also be effective in checking infestation, and clean cultivation should be practised. It is difficult to apply sprays uniformly from top to bottom of the vines. Paris green at the ordinary strength injures the foliage, but a spray of Paris green, Bordeaux mixture and lead arsenate was found effective.

Muliyil (J. A.). **Experiments in Grasshopper Control by Poisoned Bait in South India.**—*Sine loco*, n.d., 13 pp. [Received 5th October 1921.]

This paper, with a foreword by Mr. Ballard, records continued experiments made since 1914 with poisoned baits against grasshoppers.

In 1914 *Chrotogonus saussurei*, Bol., was successfully controlled by a poisoned bait, which was also used against the Deccan grasshopper (*Colemania sphenarioides*, Bol.) in five different experiments, which are here described. The bait consisted of rice bran, jaggery syrup, Paris green and limes, and proved fairly attractive but was limited in its action.

The present experiments, which began in August 1919, aimed at determining the relative proportions in which the various ingredients should be used, and above all the choice of a fruit or essence which would increase the attractiveness of the bait. The formula tried was 1 lb. Paris green and 6–10 lb. jaggery for every 25 lb. bran. Jaggery was first dissolved in water, to which was added Paris green and bran mixed together, and all mixed until half solid. To this was added the fruit or essence under trial and a handful of salt.

Experiments were then conducted with 1½ limes in the bait, which when thrown broadcast proved successful and economical. Fair success was obtained with 30 m. in aniseed oil to every 1 lb. of bait, also with bananas, but poor results were obtained with ripe tomatos. Very favourable results were also obtained with terpinol, an essence with a strong smell, 15–20 drops being used for 1 lb. of bait. This bait was most successful in controlling *Chrotogonus saussurei* at Coimbatore. Another essence, Carvene, was used, but was unsatisfactory.

Far better results were obtained with one grapefruit to every 3 lb. bait, than with limes or tomatos ; this proved especially attractive to *Orthacris ramakrishnai*, Bol., and *O. acuticeps*, Bol. Almost all the common species have been found among the dead grasshoppers, but *C. saussurei*, *Aeolopus tamulus*, F., *A. indicus*, Bol., *Atractomorpha crenulata*, F., and *Catantops indicus*, Bol., have a special liking for the bait.

HAVILAND (M. D.). **On the Bionomics and Post-Embryonic Development of certain Cynipid Hyperparasites of Aphides.**—*Qtrly. Jl. Microscop. Sci., London*, lxv, pt. 3, August 1921, pp. 451–478, 11 figs. [Received 7th October 1921.]

The various stages of the Cynipids, *Charips* spp., are described, and comparisons are drawn between their larvae and those of other entomophagous Cynipids and parasitic Hymenoptera in general. The bionomics of these hyperparasites have already been noticed [*R.A.E.*, *A*, ix, 178].

NEAULT (A.). **Insectes nuisibles des Forêts. iv.—La Chenille à Tente d'Amérique,** *Malacosoma americana*, **ou Livrée d'Amérique.**—*Nat. Canad., Quebec*, xlviii, no. 2, August 1921, pp. 25–32, 1 fig.

An account is given of the life-history of *Malacosoma americana*, which occurs in Canada on cherry, hawthorn, and especially on apple. It has also been recorded on maple, beech, willow, birch, elm, poplar, oak and hazel. The natural enemies include birds, a Carabid, *Calosoma* sp., a Pentatomid, *Podisus placidus*, and bacterial and fungous diseases. The usual remedial measures, such as collection of eggs, the use of sticky bands and spraying with arsenicals, etc., are advocated.

15th Annual Report of the British Columbia Department of Agriculture, 1920.— *Victoria, B.C.,* 1921, 132 pp., 7 plates, 26 Appendices.

In 1920 the following measures were taken to control the codling moth, *Cydia* (*Carpocapsa*) *pomonella,* in British Columbia. A spray of 1 lb. lead arsenate (powder) to 40 gals. water was applied on the 25th May and again on the 29th June. Banding of trees was also employed. The inspection work carried out against this moth is described, and the necessity for car sterilisation to deal with the foreign car situation is emphasised. During August and September the pear and cherry slug [*Eriocampoides limacina*] caused considerable damage to foliage where spraying was not practised. The Colorado potato-beetle [*Leptinotarsa decemlineata*] is increasing its area of infestation.

The early frosts in the autumn of 1919 and the following winter of intermittent low temperatures killed many over-wintering insects. This factor together with more efficient spraying methods made the control of fruit tree pests in 1920 far more effective. During the last two seasons the blister mite (*Eriophyes pyri*) has been abundant on apples, having previously only infested pears. Sprays should be applied at high pressure in spring before the buds begin to swell. The apple aphis, *Aphis pomi* (*mali*), was not much in evidence in the year under review; the woolly apple aphis (*Eriosoma lanigerum*) was abundant, but owing to climatic conditions and efficient control methods only slight damage was done. As the result of effective spraying against the peach worm (*Anarsia lineatella*) in 1918 [*R. A.E.*, A, vii, 171] very little damage was reported. Other orchard pests recorded were oyster-shell scale (*Lepidosaphes ulmi*) and the flat-headed apple-tree borer [*Chrysobothris femorata*].

Studies on the life-history and control of the imported onion maggot, *Hylemyia antiqua* (*Phorbia ceparum*), revealed the presence of a partial third generation [see next paper]. The planting of a trap crop is described, this method promising to be of great value. Following the experiments of 1919 on *Phorbia brassicae* (cabbage root maggot) [*R. A.E.*, A, viii, 323] a spray was tested consisting of 1 oz. mercury bichloride dissolved in 10 gals. water, the mercury salts having first been dissolved in boiling water (1 oz. to every quart). The four applications were made at the commencement of oviposition and repeated at 10 days interval, 2 fluid oz. approximately being applied to each plant; no injury to them was recorded. A comparative experiment with tarred-felt discs and four applications of mercury bichloride resulted in 75 per cent. marketable heads in the case of the former, and 100 per cent. with the latter, the cost of which, with labour and materials, was approximately ½d. for every four plants.

Ruhmann (M. H.). **Report on the Control of the Imported Onion-maggot** (*Hylemyia antiqua*).—*15th Ann. Rept. B.C. Dept. Agric., 1920, Victoria, B.C.,* 1921, pp. Q 57–61.

In 1919 the more essential points of the life-history and control of the imported onion maggot (*Hylemyia antiqua*) were determined and are here described. A summary is given of the life-history of this pest in 1920, when the main object was to prove the existence of third generation adults. The first eggs were observed on 17th May, the first larvae on 22nd May and the first pupae on 6th June. The first adults of the second generation appeared on the 29th June.

Further experiments were continued in 1920 to determine the comparative values of trap crops and baits as control measures [*R.A.E.*, A, ix, 35]. It is thought that seedling onions were saved from infestation as many first generation eggs were deposited on the trap crops, and the value of these is thought to be great.

LYNE (W. H.). **Report of Chief Inspector of Imported Fruit and Nursery Stock.**—*15th Ann. Rept. B.C. Dept. Agric., 1920, Victoria, B.C.,* 1921, pp. Q 61–67.

Many strawberry plants in 1920 were badly infested with the crown-miner (*Aristotelia* sp.). Raspberry canes and blackberry stock were attacked by *Diaspis* (*Aulacaspis*) *rosae* and other pests. Precautions should be taken to prevent the Japanese beetle (*Popillia japonica*) from being imported with nursery stock and other plants. Larvae identified as closely allied to the native species of *Anomala* and some at present unidentified have been found on the roots of ornamental trees and of iris plants.

Anarsia lineatella was intercepted in plums, apricots and peaches; the corn ear worm (*Heliothis obsoleta*) in Mexican tomatos; *Plodia interpunctella, Pyralis farinalis, Calandra oryzae* and beetles of the genera *Tenebroides* and *Tribolium* in peanuts and rice; *P. interpunctella* in walnuts; and potato tuber moth (*Phthorimaea operculella*) in larval and pupal stages in potatoes shipped from New Zealand. Wheat from Sydney was badly infested with *Tribolium* beetles.

In April 1920, by Dominion Order in Council, an embargo was placed on lucerne hay coming from Idaho and certain parts of Wyoming and Colorado to prevent the importation of the alfalfa weevil [*Hypera variabilis*].

Insecticides and Fungicides.—*Jl. Minist. Agric., London,* xxviii, no. 7, October 1921, pp. 628–631.

It has been found necessary, from motives of economy, to postpone the introduction of the Bill for the regulation of the trade in certain of the chemicals in use for the control of pests in Britain. It is believed, however, that many manufacturers are prepared to meet the terms of the Bill even in the absence of legislation, and purchasers are urged to stipulate before taking delivery that the articles supplied should comply with the conditions laid down.

The more important provisions of the measure are as follows:— The total amount of arsenic in lead arsenate paste should not be less than 14 per cent. of the paste as sold, nor less than 28 per cent. of the paste when dried at 100° C. [212° F.], the arsenic being expressed in terms of arsenic oxide (As_2O_5). The amount of water-soluble arsenic in the paste should not exceed 0·5 per cent. expressed as arsenic oxide, and substances other than lead arsenate and water should not exceed 3 per cent. The actual percentage of arsenic in the paste, as well as the dilution required to produce a standard spraying mixture containing 0·1 per cent. of arsenic oxide, must be stated on the label. Larger percentages of water-soluble arsenic than stated above will cause injury to foliage. The standard spray mixture of 0·1 per cent. of arsenic oxide may be regarded as effective under all conditions, and even unnecessarily strong against young caterpillars, for which it may be diluted by using ¾ lb. of paste where 1 lb. is prescribed.

The standard mixture is obtained by adding 1 lb. paste to a number of gallons of water equal to the percentage of arsenic oxide.

Lime solutions should only contain lime, sulphur and water. The solution must be free from suspended matter, have a specific gravity of not less than 1·3 at 15° C. [59° F.] and remain clear at all dilutions.

The exact requirements with regard to nicotine are still under discussion. The term is sometimes used for combinations of nicotine with an acid—*e.g.*, nicotine sulphate, which, although an excellent insecticide, depends for its action on the nicotine it yields, which must be released by an admixture of an alkali or a sufficiently alkaline spraying soap. This solution can, therefore, only be valued by the percentage of free nicotine it yields, a statement of which should be given by the manufacturer.

Copper sulphate should contain not less than 98 per cent. of crystallised sulphate of copper ($Cu\ SO_4\ 5H_2\ O$).

Soft or potash soap should be labelled with the separate percentages of the fatty acids and resinous acids that it contains, and at least 95 per cent. of the total alkali should consist of potash.

Liver of sulphur should consist of a mixture of salts of potassium, chiefly sulphides, and should conform to the characters and tests given in the *British Pharmacopoeia 1914* for sulphurated potash, and should contain at least 42 per cent. but not more than 45 per cent. of sulphur as determined by the process there described. This recommendation should not in any way discourage the use of the sulphides of sodium, as the action of either potassium or sodium sulphide depends on the sulphur.

Sodium cyanide when treated with an acid should evolve at least 56 per cent. of its weight as hydrocyanic acid and potassium cyanide at least 43·7 per cent. Sodium cyanide is the cheaper of the two, and weight for weight gives off more gas.

WOODWORTH (H. E.). **A Host Index of Insects injurious to Philippine Crops.**—*Philippine Agric., Los Baños,* x, no. 1, August 1921, pp. 9–35.

In this list the insects injurious to crops in the Philippines are arranged under the scientific name of the food-plant. It is not complete, and is only intended as a basis for further records. The popular names of the food-plants, as well as of many of the insects, are given. Many of the insects are recorded for the first time as injurious to crops in the Philippines.

PARKER (J. R.), STRAND (A. L.) & SEAMANS (H. L.). **Our Present Knowledge of the Pale Western Cutworm.**—*Montana Agric. Expt. Sta., Bozeman,* Circ. 94, December 1920, 8 pp., 2 figs. [Received 10th October 1921.]

Porosagrotis orthogonia, Morr. (pale western cutworm) is gradually extending its range in Montana and becoming more injurious. In many instances crops have been destroyed for three successive years. A special fund has been set aside by the Experiment Station for the study of this moth and its possible control. Farmers are urged to report all occurrences of *P. orthogonia.* Experiments with a view to ascertaining the practical value of light-traps are still in progress. Cultivation methods appear so far to be the most reliable means of reducing injury [*R.A.E.*, A, ix, 541].

COOLEY (R. A.). **18th Annual Report of the State Entomologist of Montana.**—*Montana Agric. Expt. Sta., Bozeman,* Bull. 139, January 1921, 16 pp. [Received 10th October 1921.]

Grasshoppers have been unusually prevalent in Montana during the last few years [*R. A.E.*, A, vii, 140, 141]. A map accompanying the present report shows the infested areas. The species chiefly concerned in 1920 differed from those most prevalent in 1919 [*R. A.E.*, A, ix, 21]; they were *Camnula pellucida*, *Melanoplus atlantis* and *M. bivittatus*. The earliest reports were of *Stirapleura decussata* and *Hippiscus pardalinus*, but these did not become sufficiently numerous to be seriously injurious. Attention is being given to improving the arsenic bran mash used against grasshoppers and reducing its cost. Amyl acetate (known as "banana oil") can be used as a substitute for ground lemons or oranges, and reduces both the expense and the labour involved.

The pale western cutworm [*Porosagrotis orthogonia*] is one of the most injurious insects in Montana. A table shows the percentage of sown areas ruined by it in various localities, the total loss being reckoned at about £600,000 for 1920. The work in connection with this insect has been recorded elsewhere. [See preceding paper.]

Tortrix (*Archips*) *argyrospila* (fruit-tree leaf-roller) is injurious to apple trees in the Bitter Root Valley. The eggs are laid on the bark of the trees during July and hatch in early spring, just as the leaf buds are unfolding. The young larvae burrow among the tender leaf buds, and as the leaves expand they web them together and remain hidden. Complete defoliation frequently results, with corresponding heavy loss in the fruit crop. The use of miscible oils before the buds appear is recommended. Experiments in this connection are being conducted. The alfalfa weevil [*Hypera variabilis*] is spreading gradually over the neighbouring States, and may be already present in Montana; a careful watch should be kept for its appearance. *Loxostege sticticalis* (sugar-beet webworm) has been widely distributed in Montana for several years, but is seldom of great importance; it is hoped that it will disappear before long owing to the action of parasites.

Minor pests in 1920 were *Eriophyes pyri*, Pgst. (pear-leaf blister mite); thrips; Orthoptera, *Steiroxys trilineata*, Thom., *Stenopelmatus* spp., and *Brachystola magna*, Gir.; Rhynchota, *Blissus leucopterus*, Say (chinch bug), *Myzus ribis*, L. (currant aphis), *Aphis cornifoliae*, Fitch (sunflower aphis), and *Pemphigus betae*, Doane (sugar-beet root-louse); Lepidoptera, *Pieris* (*Pontia*) *rapae*, L. (imported cabbage worm), *Pyrameis* (*Vanessa*) *cardui*, L., on cultivated sunflowers, *Plutella maculipennis* (diamond-backed cabbage moth), *Cydia pomonella* (codling moth), *Telea polyphemus*, Cram., *Ufens plicatus*, Grote, and another Noctuid, believed to be *Onychagrotis rileyana*, Morr., damaging the bark of cottonwood trees; Diptera, *Hylemyia cerealis*, Gill (western wheat-stem maggot), in spring wheat; Coleoptera, *Leptinotarsa decemlineata*, Say (Colorado potato beetle), *Chrysomela exclamationis*, F., on sunflowers, *Cantharis nuttalli*, Say (blister beetle), Elaterid wireworms, Curculionids, and an unrecognised strawberry crown-borer; Hymenoptera, *Bruchophagus funebris*, How., damaging lucerne seed, and rare individuals of *Urocerus flavicornis*, F. (horn-tail).

Sarcophaga kellyi, Aldr., which is the principal natural enemy of grasshoppers, was also recorded.

Ballou (H. A.). **Cotton Pests and the Cotton Market.**—*Agric. News, Barbados,* xx, no. 505, 3rd September 1921, p. 282.

The general situation in regard to pests of cotton in the West Indies is reviewed. The records of appearance of the pink bollworm [*Platyedra gossypiella*] in the islands and the necessary remedial measures are enumerated. If cotton should cease to be grown for a season, a sharp watch should be kept for the appearance of the pest on its wild food-plants, okra, hollyhock, or wild cotton. Cotton stainers [*Dysdercus* spp.] also depend on wild cotton and certain small Malvaceous plants during the close season, and these should be eliminated, or cut back so that they do not bear fruit. The blister mite [*Eriophyes gossypii*] is also held in check by these remedies. The cotton worm [*Alabama argillacea*] is sometimes a serious pest, and cannot be controlled by the same methods; it is thought that the invasions are renewed every year, probably from South America.

When the demand for Sea Island cotton is renewed, the West Indies should be in a good position with regard to the industry, and it is important that legislation should be enforced, and careful inspection maintained, in order to safeguard the cultivation of cotton and ensure as far as possible its freedom from insect pests.

de Joannis (J.). **Les *Lithocolletis* des Érables.** [The *Lithocolletis* of Maples.]—*Ann. Soc. Ent. France, Paris,* lxxxix, no. 3–4, 1920, pp. 405–416, 9 figs.

Phyllorycter (*Lithocolletis*) *platanoidella,* sp. n., is described as mining the leaves of *Acer platanoides* at Boulogne. The nomenclature of the moths of this genus mining in various species of *Acer* is reviewed.

Scelsi (S.). **Contro la Mosca olearia.** [Against the Olive Fly.]—*Riv. Agric., Parma,* xxvi, nos. 36 & 38, 9th & 23rd September 1921, pp. 516–517 & 541–542.

Of the various methods tried against the olive fly [*Dacus oleae*] the poison sprays containing molasses and potassium arsenate (Berlese formula) and molasses and sodium arsenate (De Cillis formula) gave positive results if applied by a sufficient number of olive growers in co-operation [*R.A.E.*, A, i, 271]. Subsequently Lotrionte found that solutions of glucose are more attractive than molasses, and that copper sulphate is more effective than sodium and potassium arsenates. He ultimately developed his system of poison-traps with sodium arsenite as the poison [*R.A.E.*, A, ii, 289, 452, 479, 577]. Olive growers are strongly urged to employ this method as the best available.

Cimatti (V.). **Preparazione degli Insetticidi.** [The Preparation of Insecticides.]—*Riv. Agric., Parma,* xxvi, no. 40, 7th October 1921, pp. 572–574.

This popular article gives a number of formulae for the liquid insecticides in common use, together with brief notes on their preparation.

PIGORINI (L.). & GRANDORI (R.). **Azione del Solfidrato di Calcio sul Guscio delle Uova dei Lepidotteri.** [The Action of Calcium Hydrosulphate on the Shells of Lepidopterous Eggs.]—*Rend. R. Accad. Naz. Lincei, Rome,* Classe Sci. fisiche, matemat. e naturali, xxix, no. 6–8, 21st March–11th & 25th April 1920, pp. 322–325.

The shells of the eggs of *Bombyx mori*, *B. yamamai* and *Notolophus* (*Orgyia*) *antiqua* are dissolved by a solution of calcium hydrosulphate.

FEYTAUD (J.). **La Mouche de l'Asperge** (*Platyparea poeciloptera*, **Schrank**).—*Rev. Zool. Agric. et App., Bordeaux,* xx, no. 6, June 1921, pp. 49–52. [Received 4th October 1921.]

A brief account is given of the life-history of *Platyparea poeciloptera* Schr. (asparagus fly) in France. The damage caused by it and the remedial measures advocated are outlined, Lesne's observations being extensively quoted [*R. A. E.*, A, ii., 403 ; iv, 304].

NOCEDO (C.). **Dípteros nuevos Parásitos de la Langosta** (*Schistocerca peregrina*). [New Dipterous Parasites of the Locust, *S. peregrina*.] —*Rev. Agric., Mexico,* ii, nos. 3–4, 1st–15th April 1918, pp. 132–135, 183–186, 1 fig. [Received 12th October 1921.]

This paper is based on observations made in Guatemala in 1914 following the devastating locust invasion that occurred at the end of 1913 during a period of extraordinary drought. In 1914 rainfall coincided with an extensive mortality of the adults of *Schistocerca peregrina*, which was found to be largely due to parasitism by Diptera. The flies found were *Muscina stabulans*, a new Tachinid, the Phorids, *Aphiochaeta scalaris*, Lw., and other species of this genus, and an Anthomyiid, *Fannia canicularis*, L. It is not known whether the Tachinid is a cosmopolitan species, and a suggestion is made that its acclimatisation should be attempted in other countries so as to ascertain whether other gregarious and migratory locusts, such as *S. paranensis*, *S. peruviana* and *S. americana*, are attacked by it.

RAMIREZ (R.). **Plaga del Gusano rosado del Algodón.** [The Pink Bollworm Pest of Cotton.]—*Rev. Agric., Mexico,* ii, no. 5, 30th April 1918, pp. 225–231, 3 figs. [Received 12th October 1921.]

In 1917 the pink bollworm of cotton [*Platyedra gossypiella*, Saund.] appeared in the Laguna district of Mexico. On 15th November 1917 the Mexican Secretariat for Agriculture issued an order, based on the Federal Law of 21st December 1909, declaring the limitation and destruction of *P. gossypiella* to be a matter of public utility, prohibiting the transport of cotton seed and lint from the Laguna region to localities outside, fixing the limits of the infested area, requiring such transport within the infested area to be effected in closed cars reserved solely for these materials, permitting the export of ginned cotton subject to its disinfection if that measure be thought necessary by the authorities, and fixing penalties for non-compliance with these requirements. On 15th December 1917 regulations were issued requiring *inter alia* the destruction of all cotton debris in the fields after the harvest and of all the roots of cotton and of the grasses round the fields, requiring the disinfection of all store-rooms, requiring all seed, lint and cotton to be fumigated with carbon bisulphide at the

rate of 40 grammes per cu. metre of space. On 29th December the Mexican Minister of Agriculture was informed that *P. gossypiella* had spread beyond the quarantine area in the Laguna district, and either a three-year prohibition of planting or the extension of the quarantine area was advised. In January and February inspectors were appointed to see that the regulations were duly carried out. In consequence of several requests for permission to export seed, lint and cotton cake, the Secretary for Agriculture issued on 25th February 1918 a regulation absolutely forbidding the export of seed, limiting the export of carefully examined lint to districts where cotton is not grown, and permitting the export of cake made from residues from hydraulic seed presses, as no animal life is possible in such residues.

In a footnote it is stated that satisfactory results have been obtained in fumigating seed with carbon bisulphide used at the rate of 30-50 grammes per cu. metre of space; the germination of the seed was not affected.

PRIESNER (H.). **Zur Thysanopteren-Fauna Albaniens.** [On the Thysanoptera of Albania.]—*Sitz.-Ber. Akad. Wissensch. Abt. I, Vienna*, cxxviii, 1919, pp. 115-144, 5 figs. (Abstract in *Zeitschr. Pflanzenkr., Stuttgart*, xxxi, no. 1-2, 1921, p. 64.)

This paper contains much systematic information and deals with a large number of new species, with notes on several others.

PRIESNER (H.). **Ein neuer** *Limothrips* **(Halid.) aus Steiermark.** [A new *Limothrips* from Styria.]—*Ent. Zeitschr., Frankfort-on-Main*, xxxiii, no. 9, 1919. (Abstract in *Zeitschr. Pflanzenkr., Stuttgart*, xxxi, no. 1-2, 1921, p. 64.)

Limothrips schmutzii, sp. n., from the Graz region, is very similar to *L. cerealium*, Hal., and is also a pest of wheat.

FELDT (—). **Vorbeugungsmittel gegen Bohnen-Blattläuse und einige andere Erfahrungen mit Acker- und Puffbohnen in Ostpreussen.** [Preventive Measures against Bean Aphids and some other Experiences with Field and Garden Beans in East Prussia.]—*Mitt. Ver. z. Förderung d. Moorkultur i. Deutschen Reiche*, xxxvii, 1919, pp. 37–40. (Abstract in *Zeitschr. Pflanzenkr., Stuttgart*, xxxi, no. 1-2, 1921, p. 66.)

As Aphids [*Aphis rumicis*] first appear at the edges of a bean field and then spread towards the side sheltered from the wind, it is necessary to choose exposed situations and to aim at early blossoming. The seed should be submerged in mercuric chloride for two hours and then in water for twenty-four hours. Another measure consists in making the drills run north and south; drills running east and west yield taller plants, but they are shaded and more protected from wind and the crop is smaller. Carrots, hemp, parsley and coriander repel Aphids. Early potatoes should surround the bean field.

DEWITZ (J.). **Die Immunsande.** [Sands immune from *Phylloxera*.]—*Landw. Jahrbücher*, liii, 1919, pp. 435–484, 1 plate. (Abstract in *Zeitschr. Pflanzenkr., Stuttgart*, xxxi, no. 1-2, 1921, p. 67.)

This is a review of the literature dealing with the types of sandy soil that are free from the vine *Phylloxera*. Such papers have either been forgotten or are only accessible with difficulty.

Krausse (A.). **Forstentomologische Exkursionen ins Eggegebirge zum Studium der Massenvermehrung der** *Cephaleia abietis*, **L.** [Excursions of a Forest Entomologist in the Egge Mountains for the Study of a heavy Infestation of *C. abietis*.]—*Arch. Naturgesch.*, lxxxiii (1917), Abt. A, no. 6, 1919, pp. 46–49. (Abstract in *Zeitschr. Pflanzenkr., Stuttgart*, xxxi, no. 1–2, 1921, p. 70.)

The spruce sawfly, *Cephaleia abietis*, L., was very abundant in 1917–1918 in the Egge Mountains in Westphalia, occurring together with *C. arvensis*, Panz. In 1917 upwards of 600 larvae occurred per 10 sq. ft. The edges of the stands, which were much extended as a result of clear felling, were the parts most infested. In general there was no complete defoliation, so that the spruces recovered. About 20 per cent. of the larvae harboured parasites, of which *Xenoschesis fulvipes*, Grav., and *Homaspis narrator*, Grav., were the commonest. Numerous adults were captured by a spider, *Linyphia phrygiana*. Banding has not proved a suitable measure.

Herrmann (L.). **Kalk als Mittel gegen Drahtwürmer.** [Lime against Wireworms.]—*Die Umschau*, xxiii, 1919, p. 604. (Abstract in *Zeitschr. Pflanzenkr., Stuttgart*, xxxi, no. 1–2, 1921, p. 77.)

Unslaked lime worked into the soil is recommended against wireworms, which are killed when the lime is slaked by rain.

Krausse (A.). **Entomologische Mitteilungen Nr. 10. Die Arten, Rassen und Varietäten der " Waldgärtner." (Genus** *Blastophagus*, **Eichoff 1864.)** [Entomological Communications, No. 10. The Species, Races and Varieties of *Myelophilus* (*Blastophagus*) spp.]—*Zeitschr. Forst- u. Jagdwesen*, lii, 1920, pp. 168–177.

Wolff (—). **Entomologische Mitteilungen Nr. 11. Aufforderung zur Mitarbeit an der Erforschung der Biologie des grossen und kleinen Waldgärtners.** [An Appeal for Collaboration in the Biological Study of *Myelophilus* (*Blastophagus*) *piniperda* and *M. minor*.]—*Ibidem*, pp. 227–247. (Abstracted in *Zeitschr. Pflanzenkr., Stuttgart*, xxxi, no. 1–2, 1921, pp. 77–78.)

The contents of the first paper are indicated by its title.

In the second paper a number of points are mentioned as requiring study. The natural enemies of the immature stages of *Myelophilus* (*Blastophagus*) *minor* are much less destructive than those of *M.* (*B.*) *piniperda*. A new mite, *Calvolia* sp., infests *B. piniperda* and also *Ips* (*Orthotomicus*) *laricis*. *M. minor* has no Clerid enemy, *Clerus formicarius* only attacking *M. piniperda*.

Carphoborus minimus, F., may do considerable damage to the crowns of trees, and autumn storms bring down the branches perforated with the mines of this beetle.

Werth (E.). **Phänologie und Pflanzenschutz.** [Phenology and Plant Protection.]—*Zeitschr. Pflanzenkr., Stuttgart*, xxxi, no. 3–4, 1921, pp. 81–89.

The term phenology is here used for the observation of the annual developmental phases of plants and animals. The necessity for a

German phenological service is urged, and reference is made to the step in this direction constituted by the establishment of a laboratory of meteorology and phenology at the Imperial Biological Institute at Berlin. A typical problem is the great increase of *Aphis rumicis* (*euonymi*) after dry weather in spring and early summer. The various points forming the basis of such a service are discussed.

Morstatt (H.). **Zur Ausbildung für den Pflanzenschutzdienst.** [The Training needed for the Plant Protection Service.]—*Zeitschr. Pflanzenkr., Stuttgart,* xxxi, no. 3–4, 1921, pp. 89–94.

To meet the conditions existing in Germany, training for the plant protection service should comprise a preliminary general course in the branches of natural history, followed by a professional training for plant protection work embracing the whole realm of phytopathology, which term is here used in the widest sense. Mere training as an entomologist or mycologist is not sufficient.

Bodenheimer (F.). **Zur Kenntnis der Chrysanthemen-Wanzen, sowie der durch sie hervorgerufenen Gallbildung.** [Chrysanthemum Bugs and the Galls produced by them.]—*Zeitschr. Pflanzenkr., Stuttgart,* xxxi, no. 3-4, pp. 97-100.

There are many bugs much feared by chrysanthemum growers that have received but little attention. The author deals with the occurrence of these pests in 1920 in the greenhouses and plantations of the botanical gardens at Cologne and of the training institute at Geisenheim.

The species chiefly concerned were two Capsids, *Lygus pabulinus,* Fall., and *L. pratensis* var. *campestris,* Fall., and an Anthocorid, *Triphleps majuscula,* Reut. They appear between the end of May and mid-June. The adults suck the leaves, shoots and buds, leaving a black scar, and the females also cause injury by ovipositing in the parenchyma. With the growth of the bud the scar is enlarged and the affected side is stunted, while the other side is hypertrophied. According to Chifflot the larvae feed in the parenchyma, making mines that may be mistaken for those of the caterpillars of *Enarmonia* (*Grapholitha*) *minutana,* which lives in the stem and buds of *Chrysanthemum indicum.* There seem to be several irregular generations a year. The hibernating stage is unknown, but it seems certain that the adults, and perhaps also the eggs, survive one winter. The pests disappear between the end of September and mid-October.

Keeping the plants free from weeds is a very important measure. Repeated sprayings with nicotine soap, especially at the time of first appearance, are fairly successful, more so than the use of flowers of sulphur and powdered naphthaline. Jarring on to sticky surfaces in the early morning and, in greenhouses, fumigation with hydrocyanic acid gas are effective measures.

Of other Rhynchota that injure chrysanthemums, though to a less degree, the author has observed a Cercopid, *Philaenus leucophthalmus,* L., while Chifflot has recorded *Aphrophora spumaria,* L., and the Jassids, *Idiocerus scurra,* Germ., and *Jassus atomarius,* F.

PAPE (H.). **Brennnesselschädlinge.** [Pests of Stinging Nettles.]—*Deutsche Landw. Presse* [*Berlin*], xlvi, 1919, pp. 528–530, 7 figs. (Abstract in *Zeitschr. Pflanzenkr., Stuttgart*, xxxi, no. 3–4, 1921, pp. 115–116.)

The following insect pests of stinging nettles [which appear to have been of considerable economic value in Germany during the War] are mentioned: the caterpillars of *Vanessa* spp. and of *Sylepta ruralis*, Sc., the Coccid, *Orthezia urticae*, L., and Aphids. The last-named do the most important damage. The Psyllid, *Trioza urticae*, L., causes very harmful leaf-galls.

BRAUN (W.). **Das Obstbaum-Karbolineum.** [Fruit-Tree Carbolineum.]—*Illustr. Schles. Monatsschr. Obst-, Gemüse- u. Gartenbau*, ix, 1920, pp. 22, 26–27. (Abstract in *Zeitschr. Pflanzenkr., Stuttgart*, xxxi, no. 3–4, 1921, pp. 118-119.)

Carbolineum painted on nursery boxes, greenhouse walls, etc., may cause severe injury to the young growth of plants, but is suitable for treating wounds in trees, canker, etc., and for destroying colonies of *Eriosoma lanigerum*. Only water-soluble carbolineum should be used, especially for spraying. Trees may be painted in February with 20–30 per cent. carbolineum. Later on, fruit trees may be sprayed with a 10 per cent. solution (stone fruit with 5 per cent.). Carbolineum must not be used for summer sprays.

GLINDEMANN (—). **Die Bekämpfung des Fichtennadel-Mark-Wicklers.** [Measures against *Tortrix pygmaeana*.]—*Ber. Lehranst. Wein-, Obst- u. Gartenbau zu Geisenheim a. Rh.*, 1919, pp. 75–76. (Abstract in *Zeitschr. Pflanzenkr., Stuttgart*, xxxi, no. 3–4, 1921, p. 153.)

Picea pungens glauca and *P. alba* at Geisenheim have been infested for the second time with *Tortrix pygmaeana*, and many trees have been entirely defoliated. Some success was attained during the flight period in April by spraying with a solution made with 2 lb. quassia chips and 2 lb. soft soap in 25 gals. water. Weaker solutions proved useless.

LÜSTNER (G.). **Starke Schäden an Fichten und Tannen, verursacht durch die Blattlaus,** *Myzaphis abietina*, **Walker.** [Severe Damage to Spruce and Silver Firs by an Aphid, *M. abietina*, Wlk.]—*Ber. Lehranst. Wein-, Obst- u. Gartenbau zu Geisenheim a. Rh.*, 1919, pp. 130–131. (Abstract in *Zeitschr. Pflanzenkr., Stuttgart*, xxxi, no. 3–4, 1921, pp. 157–158.)

In Wiesbaden *Myzaphis abietina*, Wlk., injured *Picea pungens glauca* very severely and in Baden Baden it attacked this tree and also *P. sitchensis*, *P. excelsa*, *Abies coerulea* and *A. engelmanni*. In May the needles that have turned brown fall off. Börner recorded this Aphid in 1916 from *P. alba* near Metz. Sprays of liver of sulphur, and lysol were effective, but could not be applied in the case of tall trees. Nicotine and soft-soap are also useful.

Uzel (H.). **Der Tausenfuss,** *Blaniulus guttulatus,* **Gerv., ein Schädiger der Zuckerrübe.** [A Millipede, *B. guttulatus,* injurious to Sugar-beet.]—*Zeitschr. Zuckerind. d. Cechoslov. Republ., Prague,* xliv, 1920, pp. 299–300. (Abstract in *Zeitschr. Pflanzenkr., Stuttgart,* xxxi, no. 3–4, 1921, p. 159.)

At the end of April 1920 a sugar-beet field in Bohemia was infested with *Blaniulus guttulatus,* Gerv. Like *Julus unilineatus,* Koch, this millipede is brought to the fields in stable manure. Jablonowski reports its presence in Hungary in parts of fields where leaves, etc., have fallen and rotted. An infested field should be rolled, so as to hinder access to the young plants and germinating seeds. Collection is not practicable, but potatoes may be used as baits. Dead earthworms are a suitable bait only on garden beds. Schmitt advises that if a second beet crop is being grown the seed should be treated for twenty minutes in a solution of 5 parts magnesium sulphate and 1 part carbolic acid in 100 parts water.

von Wahl (—). **Schädlinge an der Sojabohne.** [Pests of the Soy Bean.]—*Zeitschr. Pflanzenkr., Stuttgart,* xxxi, no. 5–6, 1921, pp. 194–196.

In the course of three years the author has had an opportunity of observing at Augustenberg a number of pests on some varieties of *Soja maxima,* which up to then had not been grown in Baden. It was found that the insects recorded from dwarf beans all occurred on soy beans, so that the following list, except for *Tychea phaseoli,* applies to both crops.

The first seedlings were attacked by a number of enemies, including *Agriotes lineatus,* L., and *Melolontha melolontha* (*vulgaris*), which were able to kill the plants when they were as much as 18 inches high. In 1916 some soy bean plants were destroyed at the end of July by *Tychea phaseoli,* Pass.

About the middle of May the Coleoptera, *Phyllotreta nemorum,* L., *Psylliodes chrysocephala,* L., and *Sitones* sp. appeared. From the end of June onwards the following thrips were observed on the leaves : *Thrips physopus,* L., *T. longicollis,* Uzel, *T. discolor,* Hal. (?), *T. major,* Uzel, *T. albopilosus,* Uzel, *Aeolothrips fasciatus,* L., *A. albocinctus,* Hal., *Smymothrips biuncinatus,* Uzel, and *Baliothrips dispar,* Hal. *Lygus pratensis,* Fall., another undetermined Capsid, and an Aphid, *Siphonophora ulmariae,* Schr., also attacked the foliage.

In August, a mite, *Epitetranychus althaeae,* Hanst., increased enormously, and caused a yellowing of the leaves.

It is clear that the soy bean has found so many enemies in Baden among the pests that infest allied plants as to render problematical its cultivation on a large scale.

Piatti (—). **Azione della Chloropicrina.** [The Action of Chloropicrin.]—*Riv. di Ampel., Leghorn,* no. 9. (Abstract in *Riv. Agric., Parma,* xxvi, no. 41, 14th October 1921, pp. 593–594.)

Chloropicrin, at the rate of 20 cc. per cubic metre of space, whether the receptacles are empty or filled with wheat, and allowed to act for one week at a temperature of 59°–68° F., kills *Calandra granaria, Tenebrioides mauritanicus, Laemophloeus ferrugineus* and the larvae of the moths, *Sitotroga cerealella, Tinea granella* and *Plodia americana.* It is therefore superior to carbon bisulphide, which is inflammable and must be used in larger quantities.

DE CAMPOS NOVAES (J.). **A** *Prospaltella berlesei.*—*Chacaras e Quintaes, S. Paulo,* xxiv, no. 3, 15th September 1921, p. 209.

With reference to the occurrence of *Diaspis pentagona* (mulberry scale) in Brazil, attention is drawn to the fact that its parasite, *Prospaltella berlesei,* is now obtainable, and that supplies can be had from the phytopathological service.

DA COSTA LIMA (A.). **Os Insectos damninhos. xvii. O Piolho de São José,** *Aspidiotus perniciosus,* **Comst.** [Injurious Insects. xvii. The San José Scale.]—*Chacaras e Quintaes, S. Paulo,* xxiv, no. 3, 15th September 1921, pp. 214–218, 3 figs.

The presence of *Aspidiotus perniciosus,* Comst. (San José scale) was discovered in Brazil in January 1921. The infested plum and apple trees had been obtained from a nursery in which plants imported in 1919 from California, Buenos Aires and Montevideo were found to be infested. The infestation had begun to spread to native fruit-trees.

A brief account of this scale, its distribution, food-plants and control is given, and quarantine measures are advised, including the supervision of imports from infested countries and of all plants from the infested area and the immediate inspection of all orchards that have received plants from it.

CURRAN (C. H.). **A Revision of** *Syrphus* **Species belonging to the** *ribesii* **Group (Dipt.).**—*Canad. Ent., Guelph.,* liii, no. 7, July 1921, pp. 152–160. [Received 17th October 1921.]

The object of this paper is to facilitate the identification of Canadian species of *Syrphus,* which is at present rendered difficult owing to the scattered nature of the descriptions. A key to the species is given. These include three new ones.

MARCHAL (P.). **Introduction en France de l'***Aphelinus mali,* **Haldeman, Parasite du Puceron lanigère.**—*Rev. Zool. Agric. et Appl., Bordeaux,* xx, no. 7, July 1921, pp. 65–70.

Aphelinus mali, Hald., the Chalcid parasite of *Eriosoma lanigerum,* Hausm., has been imported from America and successfully established in various districts in France. Its general distribution over the country is considered to be only a matter of time. Under natural conditions hibernation occurs in the larval or pupal stage within the host larva. During 1921 the first adults emerged towards the end of March.

BEYER (A. H.). **Garden Flea-hopper in Alfalfa and its Control.**—*U.S. Dept. Agric., Washington, D.C.,* Bull. 964, 20th September 1921, 27 pp., 17 figs., 8 tables.

Halticus citri (garden flea-hopper) is generally distributed throughout the eastern half of the United States and sometimes causes a loss of 50 to 60 per cent. of the lucerne crop. The type of injury found on lucerne, red and white clover, and cowpeas is discussed; damage is also done to almost all garden vegetables, in greenhouses all the year round, and to out-of-door flowering plants in early spring and late

autumn and more or less throughout the summer, the sap being extracted from the leaves, giving them a bleached and mottled appearance.

The stages of this Capsid are described. The bugs are abundant from early summer to late autumn, when they either die off or seek hibernation quarters at the base of their favourite food-plants or in other protected spots. The eggs are deposited in the leaves and petioles of the food-plants, the incubation period averaging 11 days. The nymphs pass through five instars during an average period of 14 days, and the combined length of nymphal and adult stages is about 25 days. In South Carolina there are five or six generations annually.

The agility of the nymphs and adults protects them to a large extent from natural enemies ; the earlier stage nymphs are, however, attacked by the larva of a predaceous mite. The following egg-parasites are recorded : *Anaphes perdubius*, Gir., *Gonatocerus* sp., *Westwoodella americana*, Ashm., *Tetrastichus* sp., *Anagrus armatus nigriventris*, Gir., and *Abbella subflava*, Gir.

Clean culture is the best remedial measure ; plants that remain green late in the autumn and resume growth in the spring should be cleared away and destroyed in autumn, as these are favourite hibernation quarters. In cases of severe infestation, the crop should be cut and removed, and the field sprayed with a 10 per cent. solution of kerosene emulsion.

MILLER (D.). **The Pear Leaf-curling Midge. Notes on the Auckland Infestation.**—*N.Z. Jl. Agric., Wellington*, xxiii, no. 2, 20th August 1921, pp. 84–92, 10 figs.

The growing of young pear trees or nursery stock is impossible in certain districts of Auckland owing to the extensive damage caused by the pear-leaf midge. Whether the species concerned is the European one (*Perrisia pyri*, Bch.) has not yet been determined. During the infestation of 1920–21 there were at least six generations between September and February, the maximum being reached when the third and fourth generations overlapped. The eggs are deposited between the folds of the young leaf as soon as it bursts from the bud. As many as 35 may be laid at one time ; these hatch in about four days. The infested leaf grows rapidly, but is unable to unfold, and owing to the destructive action of the larvae combined with the lateral growth, the leaf curls further inward from each side along the midrib in the form of a double tube and rapidly turns black, ultimately becoming hard and brittle as the larvae mature. The latter then drop to the ground and pupate in the soil, the adults emerging about 10 to 14 days later. The life-cycle from egg to adult lasts from 25 to 30 days according to the season. Hibernation occurs in the ground in the larval stage.

All commercial varieties of pears are liable to attack, though vigorous and early ones are, if anything, less severely injured. The Chinese birch-leaf variety, used as stock, is practically immune, but the grafted forms on the same stock are severely infested. The midge is often distributed in infested soil, and once established the adults spread rapidly on the wing or by the agency of the wind.

One of the most important methods of control is the treatment of the soil infested by larvae and emerging adults. This may be done by means of chemicals or by cultivation. Covering the ground to a depth of four inches with uninfested soil proved effective.

The numbers of the larvae may also be reduced by frequently turning over the ground and by raking. The development of suckers from the roots should be prevented, as they form a breeding ground.

Excellent results were obtained by spraying the ground with undiluted kerosene, a strong solution of tar water and a strong emulsion of tar oil, but weaker solutions of these substances, kerosene emulsion, potassium sulphide solutions, as well as shallow injections of carbon bisulphide in varying proportions, produced negative or poor results. Experiments are now in progress with a view to finding a spray which will act as a deterrent to the ovipositing females. No parasites have yet been bred, but a Dolichopodid fly, *Psilopus mobilus*, and a dragon-fly, *Austrolestes colensonis*, are said to be predaceous on the adults. The larvae of an unidentified Coccinellid are frequently found in soil infested by the larvae, on which they are predaceous in confinement.

HYDE (W. C.). **Test for Control of Leaf-hoppers on Apple Trees.**—*N.Z. Jl. Agric., Wellington,* xxiii, no. 2, 20th August 1921, p. 110.

The Fulgorid, *Pochasia australis,* may be successfully checked on apple trees by the addition of Blackleaf 40 to two or three of the standard spring sprays. In the tests described the first application was made on 29th October, when the apples had set and the larvae were emerging and feeding along the midrib on the lower surface of the leaves. The spray consisted of lime-sulphur 1–100 [? gals.], 3 lb. lead arsenate and 1 pint Blackleaf 40. A second application was made on 22nd November. In December the pest became fairly abundant except over the area that had received a second treatment, but further applications on the 17th and 27th December checked the infestation.

ALEXANDER (C. P.). **A new Species of *Tipula* injurious to Pasture Lands (Tipulidae, Diptera).**—*Insecutor Inscitiae Menstruus, Washington, D.C.,* ix, no. 7–9, July-September 1921, pp. 135–137.

Tipula graminivora, sp. n., is recorded as doing considerable injury to pasture lands in the interior of California.

SIMMONDS (H. W.). **Report on Coconut Districts of Vunilagi and Macuata.**—*Agric. Circ. Fiji Dept. Agric., Suva,* ii, no. 3, June 1921, pp. 40–43. [Received 18th October 1921.]

In various districts in the Fiji Islands where the parasites of *Aspidiotus destructor* on coconuts have been liberated, the Chalcids, *Aphelinus chrysomphali* and *Aspidiotiphagus citrinus,* have been found to be well established. It seems probable that there are really two species present under the name of *A. citrinus.*

In Naduri and Macuata Islands the mealy-bug, *Pseudococcus cocotis,* had severely damaged several coconut trees, which had been cut down and burnt by the natives. On one that was still standing was found the Coccinellid, *Neda tricolor,* the larvae of which are predaceous on this mealy-bug. A white scale resembling a species of *Poliaspis* occurred at the base of some of the leaves. The beetle, *Promecotheca reichei,* had apparently caused considerable damage in some localities; it is usually heavily parasitised.

At Vunilagi the caterpillars of *Agonoxena argualu* had destroyed from 5 to 10 per cent. of the foliage. They feed under webs on the lower surface of the leaves, destroying the tissue in straight lines in

the manner of *Levuana*. The mature larva drops to the ground and spins a flat cocoon on the upper sides of leaves or grasses; a few remain on the tree and pupate on the lower side of the leaves. Many were collected, and Chalcid parasites were reared from upwards of 50 per cent. of them. A Braconid was also obtained; probably it is parasitic on the Chalcid. A large spathe-boring larva destroyed a great deal of the inflorescence; this is thought to be the same as the species recorded by Jepson in 1915 [*R. A.E.*, A, iv, 122]. A small Pyralid was also observed, generally attacking the young nuts. This is apparently *Harpagoneura complena*, Boisd., previously bred by Jepson from Taviuni. Further data are needed regarding both of these insects; it may be possible to devise a method of trapping the former as it descends to the ground for pupation. *Diocalandra* (*Calandra*) *taitensis* was found in several nuts, and the larvae were boring at the bases of the leaves, but this weevil does not seem to be dangerous at present. Stick insects [*Graeffea cocophaga*, Newp.] were very abundant in places; smoke often causes them to drop, while burning the undergrowth destroys the eggs in large numbers. The Australian magpie has been introduced into Taviuni against this pest. An unidentified fruit-fly damaged from ½ to 1 per cent. of the total crop by attacking the fallen nuts, which seem always to have lost their calyx in falling. The maggots enter the nut through the eye and turn the contents into a slimy mass. When mature they pupate in the ground. If the nuts were hand-picked for 12 or 18 months and not allowed to lie on the ground, this pest would probably disappear. It is suggested that planters should leave small areas of native bush in the centre of their estates as breeding grounds for birds, and flowering trees about the houses would attract insectivorous ones, which would be an important aid in control.

The Histerid beetle, *Plaesius javanus*, which was introduced into Fiji from Java as an enemy of *Cosmopolites sordidus* (banana borer), has recently been recovered for the first time since three months after it was liberated, eight years ago. The banana borer is noticeably less abundant on the estate where this beetle was taken than in other plantations visited.

The fruit-fly, *Dacus passiflorae*, which does considerable damage to granadillas, oranges and mandarins, lives through a large portion of the year in guava fruits. As many as 25 per cent. of a Braconid parasite have been reared from infested guavas, and it seems probable that it keeps the fly in check during the greater part of the year, and it is only after the citrus crop begins to ripen that the fly finds the peel of the orange a sufficiently thick protection for its larva against the ovipositor of the Braconid. In view of the reopened citrus trade with New Zealand it is suggested that fruit for export should be grown in proper orchards, and that no guavas be allowed near them if possible; that all infested oranges and granadillas should be collected every week and burnt; that orchards should be registered and inspected, and that any fruit grown elsewhere should be charged double rates for repacking, and export of it forbidden after a certain date.

VEITCH (R.). **The Partial Success of the Tachinid Parasite of the Sugar-Cane Beetle Borer.**—*Agric. Circ. Fiji Dept. Agric., Suva*, ii, no. 3, June 1921, pp. 46–47. [Received 18th October 1921.]

The various attempts that have been made to introduce the fly, *Ceromasia sphenophori*, Vill., from Hawaii into Fiji, as an

enemy of *Rhabdocnemis obscura*, Boisd. (sugar-cane beetle borer), are described. It was feared that all the colonies had failed completely, but it has recently been found that at least in one district the borer has decreased enormously since 1917, while the parasite is quite abundant in many of the fields. It is true that a variety of banana more resistant to borer attack has been grown of late years, but even allowing for this, the improvement in the situation is very marked.

SWAIN (A. F.). **Miscellaneous Studies in the Family Aphididae (Hem. Hom.). V. Notes on some Lachnids in the British Museum.**—*Ent. News, Philadelphia*, xxxii, no. 7, July 1921, pp. 209–213, and no. 8, October 1921, pp. 225–229.

The species dealt with include *Pterochlorus longipes*, Dufour, on oak, of which the individuals examined agree very well with Walker's description except in a few points of minor importance; *Lachnus fasciatus*, Burm. (*farinosa*, Cholod.) on spruce; *Schizolachnus tomentosus*, DeG. (*Lachnus pineti*, F., *S. fuliginosa*, Buckt., and *Mindarus abietinus*, Koch), *Lachnus pineti*, Koch, being a different species; *Dilachnus hyalinus*, Koch (*macrocephalus*, Buckt.) on *Picea excelsa*; *Dilachnus juniperi*, DeG. (erroneously recorded by Del Guercio as *Lachniella juniperi*, F.); *D. laricis*, Wlk. (*Lachniella nigrotuberculata*, Del Guer., on larch in Italy); *D. piceae*, Wlk., on *Abies* spp. (*Lachnus vanduzei*, Swaine, on spruce in California).

Dilachnus pinihabitans, Mordw., has frequently been recorded as *pinicola*, Kalt., and the author considers that *Lachnus pinicola*, Kalt., of both Walker and Buckton is really *D. pinihabitans*. From a comparison of measurements which are given, it is considered that *Lachnus pini*, L., of Walker and Buckton is *Dilachnus taeniatus*, Mordw.

TOWER (W. V.). **Report of the Entomologist.**—*Rept. Porto Rico Agric. Expt. Sta. 1920, Mayaguez*, 19th July 1921, pp. 23-27, 1 plate. [Received 21st October 1921).

Purple scale [*Lepidosaphes beckii*] has been kept in check for the last few years in citrus groves by various beneficial fungi that flourish where windbreaks are employed. White scale [*Chionaspis citri*] has increased owing to the dry spring and summer, and is worse in young groves planted in light sandy soils than elsewhere. It has fewer beneficial fungi infesting it than *L. beckii*, and does not respond so readily to treatment. The rufous scale [*Chrysomphalus aurantii*] has been frequently found, and if it becomes more abundant should be checked by the sprays that have been found effective in Florida [*R.A.E.*, A, vi, 217].

HARRIS (F. S.) & BUTT (N. I.). **Thirty Years of Agricultural Experiments in Utah.**—*Utah Agric. Expt. Sta., Logan*, Circ. 46, June 1921, 64 pp. [Received 22nd October 1921.]

In the section of this review dealing with entomology, an account is given of the habits of, and remedies for, certain pests that have previously been dealt with in the various publications of the Utah Agricultural Experiment Station over a number of years.

In the case of the alfalfa weevil [*Hypera variabilis*] which infests lucerne and clovers, the injury is practically all done by the larva. The remedies suggested are disking in early spring to stimulate the

growth, cutting the first crop when most of the eggs are laid (about mid-May), and brush-dragging the field. A lucerne field should never be maintained for more than seven or eight years in an infested district. An arsenical spray is giving excellent results.

The second generation of the codling moth [*Cydia pomonella*] in Utah is ten or more times as large as the first. The importance of the first spray is therefore obvious, and poison thoroughly applied in June will kill 90 per cent. of the larvae that would otherwise enter the calyx in August and September. Banding is also important during the life of the first generation.

For curly leaf of sugar-beets caused by the leaf-hopper, *Eutettix tenella*, early planting, and, in some districts, early and frequent irrigation, are recommended [*R. A.E.*, A, vi, 480].

Act of the General Assembly [Pennsylvania] **No. 58, 6th April, 1921.** [Received 14th November 1921.]

This law, relating to apiculture, and the sale, transportation, etc., of bees, honey, hives, and appliances, provides for the inspection of apiaries, the prevention, control and eradication of contagious and infectious diseases among bees, and the establishment of quarantines, and prescribes the style of hive to be used after 1st July 1923, imposing certain duties on persons engaged in transportation, and providing penalties and appropriations therefor.

While the Act gives ample powers to prosecute offending apiarists, it is hoped that these will seldom need to be enforced, as the inspectors go out in the capacity of advisers, educational methods being used to impress upon those not familiar with foul-brood and other serious apiary diseases the necessity for immediate sanitary methods to ensure healthy colonies.

Quarantine Proclamation No. 84.—*Commonwealth of Australia Gaz., Melbourne,* no. 76, 29th September 1921.

An earlier proclamation dated 24th February 1921 [*R. A.E.*, A, ix, 243] regarding *Bacillus amylovorus* is hereby repealed and the present one substituted. The importation into Australia from New Zealand is now prohibited of all plants and parts of plants (including fruit), as well as the seeds of any plant of the family Rosaceae and those of any fruit tree.

Theobald (F. V.). **New and Little-known British Aphides.**—*Entomologist, London,* liv, no. 701, October 1921, pp. 230–233.

The species described are: *Anuraphis centauriella*, sp. n., on knapweed (*Centaurea nigra*), found amongst colonies of *Macrosiphum jaceae*, L., *Thripsaphis cyperi*, Wlk., on *Carex goodenovii, Pterocomma jacksoni*, sp. n., on goat willow (*Salix capreae*) in company with *P. populeus*, and *P. fraxini*, sp. n., a colony of which was found on the petiole of an ash leaf (*Fraxinus excelsior*).

Green (E. E.). **Observations on British Coccidae with Descriptions of new Species.**—*Ent. Mthly. Mag., London,* Third Ser., no. 83, November 1921, pp. 257–259, 2 figs.

The species dealt with are: *Lecanium lichenoides*, sp. n., on stems and branches of *Quercus glandulifera* recently imported from Japan;

Ceroplastes floridensis var. *japonicus*, n., on the smaller branches of recently imported plants of Japanese maple; and *C. ceriferus*, Anders., on stems of Japanese maple. These species were taken at St. Albans and were all living; the last-named was covering a batch of eggs, though whether they could have survived a British winter is doubtful.

BAGNALL (R. S.). **Brief Descriptions of New Thysanoptera.—xii.**—*Ann. & Mag. Nat. Hist., London,* viii, no. 46, October 1921, pp. 393–400.

The new species described include: *Physothrips minor* on *Ipomoea staphylina* and *Physothrips andrewsi* on rose from India, and *Elaphrothrips* (*Idolothrips*) *antennalis* on grass from Japan.

BALLARD (E.). **A Preliminary Note on** *Triphleps tantilus*, **Motsch.: an Enemy of the Pink Bollworm.**—*Agric. Jl. India, Calcutta,* xvi, no. 5, September 1921, pp. 571–573.

Ballou, in his account of the pink bollworm [*Platyedra gossypiella*] in Egypt in 1916–17, records the Anthocorid bug, *Triphleps* sp. as sucking the eggs. In 1920 an Anthocorid nymph was observed at Coimbatore similarly feeding on the eggs, but it was lost before it could be identified. In 1921 *T. tantilus* was very abundant and fed readily on both the eggs and freshly emerged larvae of *P. gossypiella*, the nymphs being apparently more voracious than the adults. In confinement the larvae seemed to be preferred to the eggs. The majority of larvae probably escape in the fields, as they quickly bore into the bolls after hatching, but the eggs are probably destroyed in large numbers, as they are generally laid in places where *T. tantilus* occurs. This Anthocorid feeds also on the cotton aphis [*Aphis gossypii*] and the cotton thrips [*Heliothrips indicus*] and apparently sometimes on cotton leaves. The eggs are laid at the base of the bolls, in the rind of young bolls and in leaf-stalks; the nymphs are yellow to orange, with red eyes. Any enemy of *P gossypiella* is of importance, and *T. tantilus* is easily reared.

SAALAS (U.). **Ueber die Borkenkäfer und den durch sie verursachten Schaden in den Wäldern Finnlands.** [Bark-beetles and the Injury done by them in Finnish Forests.]—*Helsingfors,* 1919, viii + 415 pp., 13 plates, 2 maps. (In Finnish with a German Summary.)

This excellent monograph on the various bark-beetles of Finland gives special attention to their position as forest pests and to successful remedial measures. After a review of the development of research on bark-beetles in general, the existing Finnish literature is dealt with. The author's system of investigation consisted in examining all material found on lines crossing in various directions the territory surveyed; the total length of the lines was 28,000 metres (about 18 miles) and their width was two metres. The fifty-two species of bark-beetles met with are dealt with separately.

The final section treats of the injury caused by bark-beetles and the chief reasons for their occurrence in Finland. A detailed account is

given of *Myelophilus* (*Blastophagus*) *piniperda* and *M. minor*, the adults of which cause primary injury, that of the larvae being mostly secondary. Large stacks of firewood and forest fires favour the increase of these species. The most common of the other pine bark-beetles are *Pityogenes quadridens* and *Hylastes* (*Hylurgops*) *palliatus*; *Ips proximus*, *I. acuminatus* and *I. suturalis* are fairly common, the last-named being the most injurious in the opinion of the author, who considers forest fires to be the chief cause of its spread. *I. laricis* is common, but unimportant as regards forestry. *I. sexdentatus* and *Pityogenes bidentatus* are somewhat scarce and, like *Crypturgus pusillus* and *C. cinereus*, do no harm. *Pithyophthorus lichtensteini* is an entirely primary, rare pest of pines. *Hylastes brunneus* is a very rare species.

A number of Finnish bark-beetles breed under the bark of spruce stems and branches. *Dendroctonus micans*, which is rare, occupies a special position among them, as it infests living trees only, though in many cases observed the latter were suffering from fungus attack. *Ips typographus*, *Pityogenes chalcographus*, *Polygraphus subopacus* and *Hylastes palliatus* are very common, the last-named being of little importance, while *Ips typographus* is the most harmful. *Polygraphus poligraphus*, *Hylastes* (*Hylurgops*) *glabratus*, *Crypturgus hispidulus* and *C. cinereus* are common; the first of these is a primary pest, capable of doing much harm. Among fairly common species are *Xylechinus pilosus*, *Cryphalus saltuarius* and *Ips suturalis*; they can do primary injury. Damage by storms is said to be the chief cause of the increase of the spruce bark-beetles. Infestations reach their maximum two or three years after storms and then decrease year by year.

In birch woods *Scolytus ratzeburgi* does important local damage to trees injured by fires or storms.

Xyloterus lineatus, common on pine and spruce, and also found on larch, is the only bark-beetle breeding in the wood itself; *X. signatus* and *X. domesticus* breed in the wood of deciduous trees. All three are usually found in areas damaged by storms.

A knowledge of the date of the larval period is essential for successful control. The larvae of *Myelophilus piniperda* and *M. minor* chiefly occur in June, and those of *Ips typographus*, *Pityogenes chalcographus* and *Xyloterus lineatus* in July. *Polygraphus* spp. and *Scolytus ratzeburgi* hibernate in the larval stage, and may be found in that stage throughout the year.

KRAUS (R.). **Sobre el Estado actual de la Destrucción de la Langosta con el Cocobacilo acridiorum d'Herelle.** [The Present Situation with regard to Locust Destruction by *Coccobacillus acridiorum*, d'Herelle.]—*Rev. Inst. Bact., Buenos Aires,* iii, no. 1, January 1921, pp. 297–300.

The author discusses the views of various investigators regarding the value of *Coccobacillus acridiorum*, d'Her., in the work of locust destruction, and quotes these as confirming his own opinion [*R. A. E.*, A, v, 133] that this organism, when increased to its greatest virulence, can kill the locust only by peritoneal injection and not by ingestion, and, moreover, that it is a normal inhabitant of the intestine of the locust.

SCHAFFNIT (E.). **Eiweisserdalkaliverbindungen als Zusatzstoffe für Bekämpfungsmittel zur Erhöhung des Haftvermögens.** [Combinations of Albumen and Earth Alkalis as Addition to Sprays to enhance their Adhesiveness.]—*Zeitschr. Pflanzenkr., Stuttgart,* xxxi, no. 1–2, 1921, pp. 19–22.

Such adhesives as resin-soap, molasses, etc., do not satisfactorily prevent insecticides and fungicides from being washed off by rain. To be effective an adhesive must not only confer lasting sticking power, but must pass from a condition of solubility in the solution to one of insolubility on the leaves, without interfering with their functions.

Colloidal substances in the albumen group, especially in combination with earthy alkalis, such as calcium and barium, are excellent. A combination of casein and lime was very effective. To make it, 20 gms. of finely powdered milk albumen free from fat are mixed with 5 gms. of calcium oxide (cooled after being made thoroughly incandescent), and then 150–200 cc. of water are slowly mixed in. In about half an hour a gummy mass results, which can be thinned with more water and then added to 100 litres spray solution.

Analysis of sprayed foliage has definitely established the value of this adhesive, though the present high price of casein prohibits its use. Investigations are being pursued with the object of finding some cheap substance with similar properties. Once a suitable adhesive is found, dusting as a substitute for spraying will be investigated.

SWEZEY (O. H.). **Note on the Eggs of** *Araeocerus fasciculatus*, **De G. (Anthribidae, Coleoptera).**—*Proc. Hawaiian Ent. Soc., 1920, Honolulu,* iv, no. 3, September 1921, pp. 452–453.

The eggs of *Araecerus fasciculatus* here described were found in koa [*Curcuma*] pods in batches containing forty to sixty. The seeds in these pods had been eaten by the larvae of *Cryptophlebia illepida*, Butl., and the eggs were probably deposited through the hole made in the pod by the larva of the moth. Egg-clusters of *Pantomorus fulleri*, Horn, were found in the same batch of pods.

FULLAWAY (D. T.). *Cryptotermes brevis* **in Hawaii (Isoptera).**—*Proc. Hawaiian Ent. Soc., 1920, Honolulu,* iv, no. 3, September 1921, pp. 456–457.

A species of *Cryptotermes* commonly found in Honolulu has recently been identified as *C. brevis*, Wlk. In Cuba and Florida this termite is very destructive to buildings and furniture.

SWEZEY (O. H.). **A new Immigrant Weevil attacking Banana (Coleoptera, Curculionidae).**—*Proc. Hawaiian Ent. Soc., 1920, Honolulu,* iv, no. 3, September 1921, p. 457.

Stenommatus musae, Mshl. [*R. A. E.*, A, ix, 90] is recorded as injurious to bananas in Hawaii.

SWEZEY (O. H.). **A new Bark Beetle from Easter Island (Coleoptera, Cossonini).**—*Proc. Hawaiian Ent. Soc., 1920, Honolulu,* iv, no. 3, September 1921, pp. 462–463.

Sericotrogus bryani, sp. n., here described, was taken under the bark of *Broussonetia papyrifera* in Easter Island.

SWEZEY (O. H.). **A Dermestid infesting Garden Seeds (Col.).**—*Proc. Hawaiian Ent. Soc., 1920, Honolulu,* iv, no. 3, September 1921, pp. 487–488.

A Dermestid, believed to be *Eucnocerus anthrenoides*, Sharp, which occurs in Mexico and Panama, was found in large numbers in 1920 in a tin box containing garden seeds in Hawaii. The tin had apparently been tightly closed for a year and a half. Some of the packages in the box had come from Pennsylvania. Maize, both in packages and on the ear, was badly eaten, as well as other seeds. The only previous record of this beetle in Hawaii is of one individual taken in 1919.

TIMBERLAKE (P. H.). **Description of a new Species of** *Ootetrastichus* **from Formosa (Hymen., Chalcid.).**—*Proc. Hawaiian Ent. Soc., 1920, Honolulu,* iv, no. 3, September 1921, pp. 557–564, 5 figs.

The species of *Ootetrastichus* introduced from Formosa in 1916 has since become established in Hawaii [*R. A.E.*, A, viii, 72], and is here described as *O. formosanus*, sp. n. The description is taken from individuals reared from *Perkinsiella saccharicida*, Kirk., in Hawaii.

MUIR (F.). **The Sugar Cane Leafhopper and its Parasites in Hawaii.**—*Hawaiian Planters' Record, Honolulu,* xxv, no. 3, September 1921, pp. 108–123, 2 plates, 4 figs.

An account is given of *Perkinsiella saccharicida* (sugar-cane leaf-hopper), as occurring in Hawaii. The 23 known species of this genus are enumerated, with the distribution of each. A close study has been made of the various factors limiting the activities of the genus *Perkinsiella* in the countries bordering the Pacific, and efforts have been made to introduce into Hawaii as many of these factors as possible. A graph illustrates the workings of the various primary, secondary and tertiary parasites of *P. saccharicida* in Hawaii, and their inter-relations, showing 41 species that act and interact upon one another to the advantage or disadvantage of the central host. Though this interaction is fairly complicated, *Paranagrus optabilis*, Perk., is the keystone of the whole problem, and without it all the other factors would be unable to hold the leaf-hopper in check.

The primary parasites of the egg are :—the Mymarid, *Paranagrus optabilis*, mentioned above, which has 2½ generations to one of its host, and is therefore a very efficient parasite ; *Anagrus frequens*, Perk., closely related to *P. optabilis*, and with a similar life-cycle, but far less numerous ; *Ootetrastichus beatus*, Perk. ; and *O. formosanus*, Timb. The bug, *Cyrtorhinus mundulus*, Bred., feeds on the contents of the eggs, but does not increase as rapidly as could be wished. Enemies of the young and adults are the lacewings, *Anomalochrysa deceptor*, Perk., *A. raphidioides*, Perk., *A. gayi*, Perk., *Chrysopa microphya*, McLachl., and another unidentified species of *Chrysopa*, the larvae of which are predaceous ; *Conocephalus saltator*, Sauss. (long-horned grasshopper) ; the earwigs, *Anisolabis annulipes* and *Chelisoches morio* ; and the Rhynchota, *Triphleps persequens*, *Physopleurella mundulus*, *Reduviolus blackburni*, *R. capsiformis* and *Zelus renardii*. Of these, the last-named is by far the most abundant and important economically ; not only, however, does it attack both adult and young of *P. saccharicida*, but it also attacks most of the direct enemies, so that on the whole it is considered to be more harmful than beneficial

to sugar-cane. This bug has been previously recorded as *Z. peregrinus*. The spiders, *Pagiopalus atomarius* and *Tetragnatha mandibulata*, and the Coccinellid, *Coelophora inequalis*, prey upon the hoppers. Minor enemies are the predaceous wasp, *Nesomimesa hawaiiensis*; the Dryinids, *Echthrodelphax fairchildi*, *Haplogonatopus vitiensis*, and *Pseudogonatopus hospes*; and the flies, *Pipunculus juvator* and *P. hawaiiensis*. Ants, particularly *Pheidole megacephala*, are abundant in the cane-fields and attack almost all insects found there. The fungi, *Metarrhizium anisopliae*, *Entomophthora* sp., *Sporotrichum* sp. and *Cordyceps* are also of importance, the last three being directly parasitic on the leaf-hoppers. Vertebrates, especially mynah birds, play a part in the general inter-relation of factors, as they prey upon many of the larger insects in the cane-fields.

THOMAS (R.). **Entomological Section; Locusts.**—*Admin. Rept. Mesopotamia Dept. Agric., 1920, Baghdad,* 1921, pp. 4–5 and 10–11. [Received 25th October 1921.]

In Mesopotamia the locust menace occurs every year, varying only in intensity. The most destructive species is *Dociostaurus maroccanus*. The eggs are laid in the ground in May and June, and hatch in March. The larvae do most damage between the fourth moult and ten days after the final one, but they are more easily controlled up to the third moult. The locusts feed mainly on wheat and barley, considerably damaging these crops in severe attacks. There is no record of any of the remedial measures adopted under the Turkish Government being successful. The usual method is to drive the swarms into concentrated masses and stamp them underfoot. Occasionally they are driven into shallow trenches and buried. Owing to the scarcity of labour in steppe lands and the availability of oil for fuel, it is thought that the knapsack flare apparatus may prove as economical a remedial measure as any previously undertaken. A preliminary campaign will be conducted as soon as finances permit.

Date crops are considerably damaged by *Ephestia cautella*, no reliable control measures having yet been discovered. This and other date pests have already been noticed [*R. A. E.*, A, vii, 189; ix, 91]. In Northern Mesopotamia non-irrigated wheat crops are considerably damaged by *Eurygaster* sp., which is a common pest in similar areas in Russia, Turkestan and Persia. The cotton bollworm (*Earias insulana*) infests practically every cotton crop, but in the earlier part of the season it breeds in pods of *Hibiscus esculentus*. No reliable remedial measures are known, but by removing all parts of the cotton plants and of *H. esculentus* as early as practicable and burning them in the winter, the intensity of the attacks may be diminished.

The pink cotton bollworm (*Platyedra* (*Ephestia*) *gossypiella*) has not yet been recorded in Mesopotamia. All imported seed is fumigated, but there may be a danger of introduction in the seed imported through Mesopotamia into Persia.

TREHERNE (R. C.). **The Grasshopper and the Range.**—*Agric. Jl., Victoria, B.C.,* vi, no. 8, October 1921, pp. 192–193, 195.

The problem of controlling grasshoppers on the range lands of British Columbia, which has recently been dealt with [*R. A. E.*, A, ix, 489], is here discussed in greater detail. It is obvious that when the natural range grasses are destroyed by cattle-feeding or by the cultivation of

former range ground, the grasshoppers that subsist on these grasses will migrate further afield in search of suitable food. In this respect they are always ahead of the native parasites, such as Sarcophagids, Bombyliids, *Trombidium* spp., etc., and are more active on the wing, so that the efficiency of the parasites is lessened in proportion to the distance travelled in search of food. This migration also eliminates almost entirely the influence of bacterial or fungous diseases, which can only operate successfully under congested conditions, the larvae of predatory beetles, which move through the soil and devour the egg-clusters, and other natural enemies. Every effort should therefore be made to re-establish range grasses in such a manner and in such quantities as to keep the grasshoppers more or less localised. The various types of country should also be studied and the species likely to inhabit such environment determined.

As a result of two years' investigation, the known species of grasshoppers in British Columbia have now been recognised as belonging to two main groups, namely, the species inhabiting the open range, and the sylvan species, occurring in timbered land. Of the former, about half frequent open grass land and half are found only on the rocky ridges. The more depleted a range becomes of grassy vegetation, the more suitable it becomes for them. Less than fifteen years ago the ordinary range grasses grew waist high and were frequently cut for hay. Since their depletion the number of grasshoppers seems to have materially increased. It is believed that if the grass on open range land were allowed to grow freely, seed itself and multiply, the open country grasshoppers would be forced to retreat to the gravel ridges, where the grass is short owing to the soil conditions. Thus localised fungous and bacterial diseases would maintain a more natural balance, and artificial poisoning would be rendered possible. All ranchers are therefore urged to co-operate with departmental officials in improving range conditions by rotation, drift fences and community action.

RUTGERS (A. A. L.). **Verslag** [Report] **van den Directeur 1 Juli 1920–30 Juni 1921.**—*Meded. Algem. Proefst. A.V.R.O.S., Medan,* Algem. Ser., no. xiii, 1921, 25 pp.

The entomological section of this report, by Mr. J. B. Corporaal, states that *Hevea* suffered little from insect pests. A Psychid caterpillar, *Acanthopsyche* sp., and termites, *Coptotermes curvignathus*, Holmgr., caused some damage.

On two tea estates *Helopeltis antonii*, Sign., and, to a less degree, *H. theivora*, Wlk., appeared. On one of these, pruning of the *Sesbania* shade-trees and intensive collection cleared off the infestation within a few weeks, while on the other collection was carried on through the year. Tea was also infested by the "bunch caterpillar" which is a Notodontid, *Bombisatur corporaali*, van Eecke, not to be confused with the "bunch caterpillar" of British India, *Andraca bipunctata*, Wlk. The habits of the two moths are identical. Coleopterous pests of tea included *Phytorus dilatatus*, Jac.

The coffee-berry borer, *Stephanoderes hampei*, has spread to nearly all estates and has become a serious pest. In some cases the planting of coffee has been given up.

Coconuts were again infested by Lepidopterous pests. *Brachartona* [*catoxantha*] did less damage than in previous years owing to the

action of natural enemies. Bagworms (Psychids) were injurious on two estates, but experiments in spraying were not continued as natural enemies brought the infestation to an end.

Oil-palm pests included *Oryctes rhinoceros*, L.; the much rarer *O. trituberculatus*, Lansb.; *Rhynchophorus ferrugineus*, Ol. var. *schach*, F., found in five localities, in two of which the trees had been killed; *Xyleborus* sp., which had bored the ribs of the palm leaves and had apparently migrated from infested coffee growing among the palms; bagworms that in some cases caused entire defoliation; and caterpillars of *Amathusia phidippus*, L., *Discophora celinde*, Stoll, *Orthocraspeda trima*, Moore, *Setora nitens*, Wlk., and in the fruit clusters, *Melissoblaptes rufovenalis*, Snell., which is also a pest of coconut.

HEYMONS (R.). **Mitteilungen über den Rapsrüssler,** *Ceutorrhynchus assimilis*, **Payk., und seinen Parasiten,** *Trichomalus fasciatus*, **Thoms.** [Communications on the Rape Weevil, *Ceuthorrhynchus assimilis*, and its Parasite, *T. fasciatus*.]—*Zeitschr. angew. Ent., Berlin*, viii, no. 1, September 1921, pp. 93–111, 10 figs.

The observations here recorded on *Ceuthorrhynchus assimilis*, Payk., which is a serious pest in North Germany, refer to rape unless otherwise stated. This weevil was practically the sole representative of its genus in the fields examined near Berlin, though *C. sulcicollis*, Gyll., was also seen.

The adults appear early in the spring, before the rape blossoms. When the investigations began, on 19th April 1920, infestation, averaging two weevils per plant, was already noticeable. They feed on the flower-buds and stalks by night as well as by day, but from an economic standpoint the spring infestation is unimportant. On 23rd April mating occurred in the laboratory, and was observed in the field on the 25th. On 14th May oviposition was first observed, the eggs being deposited in a rape pod, in a hole specially bored with the proboscis. Towards the end of the oviposition period the weevils die in increasing numbers, only a few females being seen boring pods in the first fortnight of June.

The egg is laid near a seed inside the pod, and sometimes within a seed. The egg-stage averages 8–9 days. The first newly hatched larva was found in a rape pod on 19th May. After destroying the ripening seeds in four or five weeks the larva cuts a hole through the pod and drops to the ground, where pupation takes place. After about ten days the young adult breaks its earthen pupal cell and works its way to the surface. In July and August, after rape had been harvested, considerable numbers of young weevils were seen on the sides of paths, or in fallow fields on wild mustard (*Sinapis arvensis*). With the advent of cold weather the young weevils seek shelter. It is probable that hibernation occurs in or on the ground.

These observations show that *C. assimilis* has only one annual generation, and agree with existing records on allied species.

The larvae were parasitised by a Pteromalid, *Trichomalus fasciatus*, Thoms., which does not appear to have been recorded from this weevil. Other species of *Ceuthorrhynchus* are also probable hosts. The parasites occurred chiefly in May, and though oviposition was not observed, it appears that only one egg is laid on a weevil larva inside a rape pod. All the parasitised larvae were about half-grown.

This parasite does not appear to attack more than one larva, and three or four days after destroying its host it pupates in the rape pod without making a cocoon. The pupal stage lasts 8–10 days.

Kleine (R.). **Wie lässt sich der Frass von** *Grapholitha dorsana* **vermeiden?** [How is Injury by *Cydia dorsana* to be avoided?] —*Zeitschr. angew. Ent., Berlin,* viii, no. 1, September 1921, pp. 112–118.

Peas are an important crop in Germany, but are liable to severe infestation by *Cydia* (*Grapholitha*) *dorsana*. Different varieties of pea vary in their demands on the soil, and a variety grown in unsuitable soil is weak and much exposed to attack. Even on good soil infestation may be severe if rainfall and temperature are unfavourable. General weather conditions are the chief factor, and a dry year favours *C. dorsana*.

This moth is on the wing in May and June, and the larva appears in June and July.

It is very important that the crop should remain dry. In 1919 rain fell on 25th and 26th July during the harvest, and the peas mowed after the rain were attacked, whilst those cut previously were not infested. This shows that the age of the pea is immaterial, and that a fully mature seed is attacked if it contains or reabsorbs sufficient water.

Mixed sowing is the one successful method of combating infestation, and several years' observations show the advantage of a mixed crop of oats and peas. Experimentally they were sown in equal proportions, but the author believes that the proportion of pea seed should not exceed one-third. The object is to have the peas always protected by the other plants, which should not be oats alone; barley, at least, should be added. Further experiments may show if other Leguminosae could be included in a mixed crop.

Herrmann (—). **Arsensalze zur Bekämpfung des Apfelwicklers** (*Carpocapsa pomonella*, **L.**). [Arsenic Salts against *Cydia pomonella*.]—*Zeitschr. angew. Ent., Berlin,* viii, no. 1, September 1921, pp. 119–124.

Cydia (*Carpocapsa*) *pomonella*, L., is one of the worst fruit pests in Germany, and in spite of restrictive legislation, arsenical insecticides are being increasingly employed against it.

To test the value of arsenicals under German conditions experiments were begun in 1914 and continued in 1919 and 1920, with the following salts: Paris green containing 58 per cent. of arsenious acid and commercially known as Urania green; a lead arsenate containing 32·9 per cent. of arsenic acid; and "Zabulon," a lead arsenate containing arsenic acid. Spraying was done immediately after blossoming and was repeated 3–4 weeks later.

In 1914 spraying decreased the loss in fallen fruit by more than one-half. In 1919, 26·9 per cent. of the fruit on unsprayed trees was infested, 18·7 per cent. on trees sprayed with Urania green, and 15·8 per cent. on trees sprayed with the lead arsenate containing 32·9 per cent. of arsenic acid. In 1920 these two salts gave equally good results, while "Zabulon" proved somewhat less efficacious.

HOLSTE (G.). **Fichtenzapfen- und Fichtensamenbewohner Oberbayerns.** [Insects inhabiting Spruce Cones and Spruce Seed in Upper Bavaria.]—*Zeitschr. angew. Ent., Berlin,* viii, no. 1, September 1921, pp. 125–160, 15 figs.

These investigations were begun in 1919, having been suggested by Trägårdh's paper on the pests of spruce and pine cones [*R. A. E.*, A, vi, 90].

The injurious species may be divided into pests of seeds and pests of cones.

As regards the pests of the seed very little can be added to Seitner's results on *Plemeliella abietina*, Seitn. (spruce-seed gall-midge). The author found the larvae of *P. abietina* only within the spruce seed, or—in a few instances—working their way out of the seed that had been husked. Pupation usually occurs within the seed, and in the open is comparatively rare, but is possible in the case of fully mature larvae that have been removed from seeds. Trägårdh erroneously referred larvae of *Plemeliella*, which he did not recognise as such, to the early larval stage of *Perrisia strobi*. *P. abietina* seems to occur everywhere in Upper Bavaria, and as many as 68 larvae have been found in a single cone. They appear to be more sensitive to dryness than their parasite, *Torymus azureus*, Boh., for a sample of seed kept quite dry up to 21st January 1920 yielded no midges, while two specimens of *T. azureus* appeared in May.

The larvae of the Chalcid, *Megastigmus abietis*, Seitn., were obtained in several batches of seed. Feeding was found to be over by March and April, the seeds being then quite empty, only a portion of the skin being left. This is characteristic of *M. abietis*, and does not occur in the case of *P. abietina*. The larva described by Trägårdh as that of *Torymus azureus*, Boh., is certainly that of *M. abietis*.

A beetle, *Ernobius abietis*, F., is a common pest of spruce cones and seeds. The statement of previous authors that the female oviposits on cones on the trees appears to be correct, as fallen cones were not infested in the breeding experiments. Destruction of the seeds by *E. abietis* is probably chiefly due to the young larvae; six per cent. of one batch of seeds was damaged by this beetle.

The pests of cones comprise three different groups: those that abandon the cones in autumn before they fall; those that reach the ground in the fallen cones and complete their development in them; and those that probably infest cones that have already fallen, completing their development there.

Dioryctria abietella, Schiff., is the sole representative of the first group. As the cones examined were collected in winter and early spring, no living stages were taken of this moth, which is on the wing in July. The traces of infestation showed it to be generally distributed in Upper Bavaria. Quite a number of cones that had been infested remained on the trees instead of falling in autumn.

The second group embraces *Ernobius abietis*, already dealt with, *Perrisia strobi*, Winn., *Camptomyia strobi*, Kieff., and *Cydia* (*Laspeyresia*) *strobilella*, L. *P. strobi* (spruce-cone-scale gall-midge) has been constantly confused with *Plemeliella abietina* (spruce-seed gall-midge), and even Trägårdh came to incorrect conclusions on this point. His minute description of the developmental stages and of the adults of *Perrisia strobi* satisfy all requirements if it is borne in mind that the larva in the spruce seeds is that of *Plemeliella abietina*. This discovery of the author's is confirmed by Seitner, who states, in a letter

dated 17th October 1919, " from galls in the spruce cone-scales I have obtained only *Perrisia strobi*, and from spruce seed only *Plemeliella abietina*." *Perrisia strobi* is found throughout Upper Bavaria; as many as 16 adults have emerged from one cone. *Camptomyia strobi*, Kieff., is described. It is the commonest gall-midge in spruce cones in Upper Bavaria, the flight-period extending from 10th May to 17th June. Some cones contained 20 larvae. The larvae develop in or on cones on the trees, and hibernation normally occurs between the scales of cones on the trees. Pupation also takes place there in a whitish cocoon. The spruce-cone moth, *Cydia* (*Laspeyresia*) *strobilella*, L., is well known. Every batch of cones from Upper Bavaria contained this moth.

The third group, embracing species that probably infest cones that have already fallen, includes *Coprodiplosis coni*, Kieff., *Clinodiplosis piceae*, Kieff., *Lestodiplosis holstei*, Kieff., *Winnertzia conorum*, Kieff., *Hyphantidium terebrellum*, Zck., *Sciara* sp. (?), and *Oscinosoma pratense*. *Coprodiplosis coni*, Kieff., has its flight-period from about 20th May to mid-June. The cocoon, with its reddish pupa, is similar to that of *Camptomyia strobi*. *Clinodiplosis piceae* was obtained near Munich. The author bred one male specimen of *Lestodiplosis holstei*. In the case of *Winnertzia conorum*, Kieff., males seem to predominate. The Phycitid moth, *Hyphantidium terebrellum*, was obtained from cones that had been lying on the ground for a considerable period. A Dipteron, *Sciara* sp. (?), was bred from fallen cones, some of them old ones, and the larvae of another small fly, *Oscinosoma* (*Oscinis*) *pratense*, develop and pupate in cones that have been lying for a long time on the ground.

Particulars are given of the parasites of some of the pests mentioned. *Plemeliella abietina* is parasitised by *Torymus caudatus*, Boh., and probably by *T. azureus*, Boh., also. Both species are found in spruce cones in Upper Bavaria; and there is evidence to show that *Torymus* is also a parasite of *Perrisia strobi*, since it was bred from cones that no longer contained seeds. *Torymus* is not, as Trägårdh supposed, a seed-feeder, the error originating in his finding in the seed the larvae of *Megastigmus abietis*, Seit. (while the hairy larvae of *Torymus* escaped his notice), and in his obtaining no adults of *Megastigmus*, but only numerous *Torymus* [*cf. R.A.E.*, A, vi, 91].

Trägårdh considers the Hymenopteron, *Aprostocetus strobilanae*, Ratz., to be a parasite of *T. azureus*, but the author states that it parasitises *Plemeliella abietina*, as he has bred it from seed exhibiting typical infestation by this midge; he is also inclined to consider it a parasite of *Perrisia strobi*. *Anogmus strobilorum*, Thoms., and the parasite of *Perrisia strobi*, *Platygaster contorticornis*, Ratz., were obtained from seeds, so that they also are parasites of *Plemeliella abietina*.

The parasites of *Ernobius abietis* include the Braconids, *Baeacis abietis*, Ratz., and, probably, *Coeloides strobilorum*, Ratz.

Perrisia strobi has a number of enemies. Both *Torymus azureus* and *T. caudatus* are probable parasites. *Platygaster contorticornis* was obtained from cones that yielded this midge, and, as already stated, *Aprostocetus strobilanae* is thought also to be a parasite of it. Other probable parasites are *Anogmus strobilorum*, Thoms., *Eutelus piceae*, Ruschka, and *E. strobicola*, Ruschka.

In addition to the parasites of *Cydia strobilella* recorded by Trägårdh, *Ephialtes strobilanae*, Ratz., and *Bracon pineti*, Thoms., were obtained. The flight-period of the latter immediately follows that of its host.

A Pteromalid, *Elachistus nigritulus*, Zett., which is probably a parasite of *L. strobilella*, is on the wing from mid-May to early June. The author's reason for believing it to be a parasite of the moth and not of a gall-midge is that its larvae appeared on one day in large numbers, and a Lepidopterous larva can harbour many Pteromalid parasites, whereas a Cecidomyiid larva obviously cannot do so.

RUSCHKA (F.). **Zwei neue Chalicidier aus Fichtenzapfen.** [Two new Chalcids from Spruce Cones.]—*Zeitschr. angew. Ent., Berlin,* viii, no. 1, September 1921, pp. 160–161.

This is a description of the new Chalcids, *Eutelus piceae* and *E. strobicola,* mentioned in the preceding paper as probable parasites of *Perrisia strobi,* Winn.

BÖRNER (C.). **Zur Heimatfrage der Reblaus.** [On the Question of the Original Habitat of the Vine Louse.]—*Zeitschr. angew. Ent., Berlin,* viii, no. 1, September 1921, pp. 163–167.

Lindinger's view that the original habitat of the vine louse [*Phylloxera vastatrix*] is the shores of the Black Sea [*R. A. E.*, A, ix, 256] is considered untenable, and the reasons why it must have come from America are given.

North America is the home of the majority of Phylloxerids, and nearly all species producing specific leaf-galls occur there exclusively. The vine-louse was discovered on an American vine by Asa Fitch in 1854, and later on it was found on wild vines in the Mississippi basin. European outbreaks did not occur before the sixties, and it is almost certain that they followed the importation of infested material from North America. All attempts to practise viticulture in North America with ungrafted European vines have failed, since no variety of the European vines, *Vitis vinifera* and *V. silvestris,* is immune to this pest. In its original habitat both susceptible and immune vines must have been present, and the wild vines in America at the present day show all gradations from complete susceptibility to complete immunity. The fact that some vines of eastern Asia are very resistant and even partly immune shows that the resistant and immune American vines are not the result of selection against the Aphid, but that the latter has gradually adapted itself to certain varieties. In connection with this view it may be found that two or more biological races of the vine louse occur in America. Recent breeding experiments undertaken by the author with the object of transforming root forms into leaf forms indicate the probability that the original habitat of the genus is the primeval forest harbouring the tropical or subtropical genus, *Vitis,* on which this Aphid was able to live, not only in leaf-galls, but on all parts of the plant, both above and below ground. The author considers that this was possible in the uniformly moist rain-forests of the tropics or subtropics. The root forms in his experiments infested (and produced galls on) the leaves and shoots irrespective of daylight, provided a uniform optimum degree of moisture was supplied. According to this view the root form is an earth-inhabitant because it finds there the necessary moisture. The present-day type of root form was first fixed when the Aphid spread to drier regions. The leaf-gall-producing forms have, on the other hand, retained their original biological characters, as their closed galls protect them against climatic changes.

PRELL (H.). **Ueber Biologieformeln als zweckmässige Zusammenfassung wichtiger biologischer Daten von Insekten.** [Biological Formulae as an efficient Resumé of important biological Data referring to Insects.]—*Zeitschr. angew. Ent., Berlin,* viii, no. 1, September 1921, pp. 179–181.

Some modifications of Rhumbler's symbols for representing the life-history of insects [*R. A.E.*, A, viii, 269] are suggested, with examples. [Other modifications have been published by Börner, *R. A.E.*, A, ix, 547.]

FRIEDERICHS (K.). **Was ist** " *Silpha atrata* " **?**—*Zeitschr. angew. Ent., Berlin,* viii, no. 1, September 1921, pp. 182–183.

Text-books dealing with insect pests usually refer to the carrion beetles infesting young beet as *Silpha atrata.* Most of the beet-infesting carrion beetles recorded under this name belong to the three species, *Blitophaga opaca,* L., *B. undata,* Müll. (= *reticulata,* F.), and *Silpha obscura,* L. The extent to which the last-named is involved is doubtful. It is not clear whether *S. nigrita,* Creutz., and *Thanatophilus rugosus,* L., are occasionally injurious.

GINS (W.). **Ueber die Schäden der Blattschneiderameisen in Süd-Amerika.** [The Damage done by Leaf-cutting Ants in South America.]—*Zeitschr. angew. Ent., Berlin,* viii, no. 1, September 1921, pp. 183–184.

Attention is called to the losses caused by one of the four or five highly destructive species of leaf-cutting ants, *Atta* spp., in Brazil. Newly planted beds of cabbage seedlings may be almost destroyed in a single night. All varieties of cabbages, turnips, radishes, roses and peach leaves are particularly attractive, and young plants are preferred. In the case of orange trees the ants climb the tree and cut off the leaves.

If the main nest is exposed, petroleum gives the best results, but if it is deep underground the injection of sulphur fumes is a better remedy.

PAX (F.). *Hylastes angustatus* **als Schädling schlesischer Kiefernkulturen.** [*H. angustatus* as a Pest in Silesian Pine Plantations.] —*Zeitschr. angew. Ent., Berlin,* viii, no. 1, September 1921, p. 185.

Very considerable injury to plantations of two and three-year-old pines by a bark-beetle, *Hylastes angustatus,* has been reported from Silesia. *H. angustatus* occurs throughout the province, but hitherto important damage has not been noticed there. Taschenberg in 1879 recorded this beetle as a pest of pines in Hungary.

ESCHERICH (K.). **Gegen eine Beschränkung der Verwendung arsenhaltiger Mittel im Weinbau.** [Against a Restriction of the Use of Arsenicals in Viticulture.]—*Zeitschr. angew. Ent., Berlin,* viii, no. 1, September 1921, pp. 185–187.

Further protests against the intention of the German Public Health Service to restrict the use of arsenicals against the second generation of the vine-moths [*Clysia ambiguella,* Hb., and *Polychrosis botrana,* Schiff.] are published.

DINGLER (M.). **Ueber den Arsengehalt von Blättern, Früchten und Wein nach Vorbehandlung mit Schweinfurtergrün.** [The Arsenic Content of Leaves, Fruits and Wine after Spraying with Paris Green.]—*Zeitschr. angew. Ent., Berlin,* viii, no. 1, September 1921, pp. 187–188.

At the request of the Imperial Biological Institute for Agriculture and Forestry, experiments were undertaken to test whether plants sprayed with a mixture of lime and Paris green, either with or without an adhesive, retain sufficient of the poison to be harmful to health. Grapes, cabbage leaves, a very hairy variety of gooseberry, and pears were sprayed during the period in which arsenicals should be prohibited according to the Imperial Public Health Service, *i.e.*, during the chief flight-period of the second generation of the vine moths. At various dates, beginning a few weeks after spraying and ending when the material was ready for consumption, the arsenic was volatilised as arsenic trichloride, and the distillate was titrated with an iodine solution of 1 per cent. normal strength. Some of the plants were washed before the tests and others were not. No trace of arsenic could be detected in grapes. The highest amount of arsenious acid present in 10 grammes of desiccated vegetables (100 grammes of fresh material) was 0·00249 gramme ; in this case an adhesive had been mixed with the spray and examination took place immediately, the material being thoroughly washed ; one month after spraying no arsenic was present except in one case, where traces of a deposit were found. One month after being sprayed the gooseberries did not show any amount of arsenic worth considering. Pears yielded traces of arsenic only when still unripe and when an adhesive spray had been used.

These tests are considered to show conclusively that the proposed restrictions are superfluous.

ESCHERICH (K.). **Uraniagrün in Tafelform.** [Urania Green in Block Form.]—*Zeitschr. angew. Ent., Berlin,* viii, no. 1, September 1921, pp. 188–189.

Hitherto Paris green has been marketed chiefly as a powder. Urania green, which is a form of this arsenical, is now available in blocks sufficient for 100 litres (22 gals.) and divided into five equal sections. The convenience of this is obvious, and the idea will certainly be adopted for other preparations of a similar character.

Mottenechte Stoffe. [Moth-proof Fabrics.]—*Zeitschr. angew. Ent., Berlin,* viii, no. 1, September 1921, pp. 189–191, 2 figs.

As a result of investigations [*R.A.E.*, A, ix, 5] a preparation for rendering wool fabrics proof against the clothes moth [*Tineola biselliella*] has been placed on the market under the name of " Eulan F." Wool can be proofed at a very low cost by immersion in a cold-water solution of the chemical followed by rinsing. Carpets and upholstering fabrics and horsehair stuffing can also be treated. It is, of course, impossible to say at present whether the protection can be relied on for many years, but on chemical grounds a permanent effect seems likely. The appearance and feel of treated material remain unchanged, and there is no disagreeable smell.

Barbey (A.). **Forêt vierge et Protection forestière à propos d'une récente Publication allemande.**—*Jl. forest. Suisse,* 1919, no. 2–4, pp. 33–38. (Abstract in *Zeitschr. angew. Ent., Berlin,* viii, no. 1, September 1921, pp. 196–197.)

This is a discussion of a paper on the conditions in the virgin forest of Bialowies [*R. A. E.*, A, viii, 419]. The striking resemblance of entomological conditions in Alpine forests to those observed at Bialowies is pointed out; the preponderance of secondary insects and the abundance of natural enemies are features common to both. The author entirely agrees with the conclusions reached by Escherich as to the need of bringing cultural methods as far as possible into line with natural conditions.

Keller (C.). **Die Forstfauna der Schweiz im Vergleich mit den Nachbarländern.** [The Forest Fauna of Switzerland compared with neighbouring Countries.]—*Festschrift für Zschokke, Basle,* no. 1, 1920. (Abstract in *Zeitschr. angew. Ent., Berlin,* viii, no. 1, September 1921, pp. 197.)

The special character of forest insects in Switzerland is very marked. The Cantharid, *Lytta vesicatoria,* occurs in the Canton of Valais up to about 5,200 feet. In high situations *Pytho depressus* is quite common, especially on *Pinus cembra. Cerambyx heros,* common in Germany, the pine moth [*Panolis flammea*] and *Rosalia alpina* are of little importance in Switzerland. *Cossus cossus* (*ligniperda*) is common up to about 3,300 feet, while *Zeuzera pyrina* (*C. aesculi*) is rare. The nun moth [*Liparis monacha*] occurs in places, but outbreaks of it are unknown, and *Dendrolimus* (*Gastropacha*) *pini* is equally unimportant, but is replaced by the pine processionary caterpillar, *Cnethocampa pityocampa,* which is a permanent and severe pest, especially at altitudes of about 3,000 feet.

The peculiar characters of the Swiss forest fauna are most marked in the mountain forests of the Alpine districts, into which many species from the plains have penetrated and even increased, probably because they encounter less competition. These include *Galeruca capreae,* on alder and birch, *Stilpnotia* (*Leucoma*) *salicis,* on poplar and willow, *Lyda erythrocephala* and other sawflies, and *Chermes* spp., such as *C. abietis* and *C. strobilobius.*

Species peculiar to high mountains, some of which also occur in the Arctic regions, include the bark-beetles, *Ips* (*Tomicus*) *cembrae* and *I.* (*T.*) *bistridentatus,* infesting *Pinus cembra*; the larch moth, *Enarmonia diniana* (*Steganoptycha pinicolana*), which causes great damage in Valais and the Engadine; *Ocnerostoma piniariella* (*Tinea copiosella*), infesting *Pinus cembra*; an Aphid, *Lachnus pinicolus*; and a Coccid, *Puto* (*Putonia*) *antennata.*

Barbey (A.). **Evolution d'un Cérambycide xylophage.**—*Bull. Soc. Vaudoise Sci. Nat.,* li, 1917. (Abstract in *Zeitschr. angew. Ent., Berlin,* viii, no. 1, September 1921, p. 206.)

Acanthocinus aedilis, L., has two generations a year, one in May and June and one in autumn. The eggs are laid in cracks in the bark of stumps or felled trunks. After a few days the larva hatches and bores into the inner bark. In three to four weeks the larva

attacks the sapwood, but the inner bark remains the chief food. Pupation takes place in the sapwood. The adults emerge three weeks later.

KELLER (C.). **Zur Biologie von** *Chrysomela aenea,* **L., und** *Coleophora fuscedinella,* **Zell.** [A Contribution to the Biology of *C. aenea* and *C. fuscedinella.*]—*Vierteljahrsschr. Naturf. Ges. Zürich,* lxii, 1917. (Abstract in *Zeitschr. angew. Ent., Berlin,* viii, no. 1, September 1921, pp. 207 and 217–218.)

The infestation of *Alnus incana* by *Chrysomela aenea,* L., in the Swiss Canton of Tessin is described. After hibernating in the ground, the beetles ascend the trees from mid-April onwards and feed for a few days. Oviposition occurs at the end of April or early in May, the eggs being laid on the lower side of the leaves. The beetles die about six weeks later. After hatching the larvae remain together for about four days and then separate. The very young larvae gnaw the mesophyll and the epidermis of the lower side of the leaves; the older larvae eat holes in them. The adults, which emerge about mid-June, attack the leaves from the edges and do not make holes. There is another generation early in August, which hibernates at the end of the month. The feeding of this Chrysomelid only results in a loss of growth. It appears to have few natural enemies, though a millipede (*Lithobius*) seems to prey upon the hibernating adults, while Syrphid larvae, including *Syrphus umbellatarum,* attack the larvae.

Alders in Tessin are also attacked by the larvae of *Coleophora fuscedinella,* Zell. The pupae are attached to the lower side of the leaves and first appear at the end of June. The moths emerge about mid-July. There is no second generation in Tessin, so that the alders renew the lost foliage and only suffer from loss of growth. The only remedial measure appears to be the collection and destruction of the pupae.

SCHEIDTER (F.). **Schlagruhe und Rüsselkäfer.** [Suspension of Felling and Weevils.]—*Forstw. Centralbl.,* 1920, pp. 144–150. (Abstract in *Zeitschr. angew. Ent., Berlin,* viii, no. 1, September 1921, p. 208.)

A postponement of felling to prevent infestation by weevils is useless, since the adults are good flyers at the mating period and cannot be kept from new plantations even by deferring felling for several years. The long life of the beetle and the prolonged oviposition period are other reasons against this practice. The problem of dealing with *Hylobius* is the most important one in the domain of forest entomology in Germany.

SCHEIDTER (F.). **Ueber Lebensweise und Bekämpfung dreier Tannenfeinde, des Weisstannenrüsslers, des krümmzähnigen und des kleinen Weisstannenborkenkäfers.** [The Life-history and Control of three Enemies of Silver Fir, *Pissodes piceae, Ips curvidens* and *Cryphalus piceae.*]—Paper prepared for the Forest Dept. of the Bavarian Ministry of Finance, 7 photogr. plates, *Munich,* 1920. (Abstract in *Zeitschr. angew. Ent., Berlin,* viii, no. 1, September 1921, p. 209.)

The dying back of silver fir [*Abies pectinata*] in the Frankenwald in North Bavaria has created conditions very favourable to secondary pests [*R.A.E.*, A, viii, 332]; of these *Pissodes piceae, Ips curvidens* and *Cryphalus piceae* are the most to be feared.

Sinz (—). **Ueber das Auftreten der Fichtenblattwespe** (*Nematus abietinum,* **Hrtg.**) **im Naunhofer Wald.** [The Occurrence of the Spruce Sawfly, *N. abietinum,* in the Naunhof Forest.]—*Tharandt. forst. Jahrb.,* lxxi, 1920, pp. 194–214. (Abstract in *Zeitschr. angew. Ent., Berlin,* viii, no. 1, September 1921, p. 219.)

Spruce in the Naunhof forest in Saxony was injured in 1919 for the twenty-sixth year in succession by *Lygaeonematus pini,* Retz. (*Nematus abietinum,* Htg.). Between 1894 and 1903 a steady increase was noticed; from 1904 to 1917 alternating increase and decrease; and since 1917 again an increase. This sawfly spreads from west to east in the direction of the prevalent winds. Most of the spruce trees are likely to die. *Picea pungens, P. sitchensis* and *P. engelmanni* are also attacked, while *P. alba* seems to be almost immune. The natural enemies of *L. pini* include tits, wood-pigeons, starlings, a Hymenopterous parasite, which infested 2 per cent. of the larvae in 1919–20, and a fungus, *Botrytis tenella,* which infested 8 per cent. In stands it is difficult to apply any remedy, but in plantations of young trees spraying with Paris green has given good results.

Keller (C.). **Zuckererzeugung in den Lärchenwaldungen des Wallis.** [Sugar Production in the Larch Forests of the Canton of Valais.] —*Natur und Technik,* 1919–20, no. 8. (Abstract in *Zeitschr. angew. Ent., Berlin,* viii, no. 1, September 1921, pp. 221–222.)

During an outbreak of *Lachnus laricis,* Koch, in larch forests in Switzerland at an altitude of about 5,600 feet, the honey-dew produced covered the needles and twigs with a sugary coating. The dried substance consisted of 22 per cent. grape sugar and up to 30 per cent. beet sugar. The outbreak is ascribed to a previous prolonged dry period. Similar occurrences are known from France (Briançon), but the insect concerned is apparently unknown.

Jegen (G.). **Zur Biologie und Entwicklungsgeschichte einiger Eriophyiden nebst systematischen Bemerkungen.** [A Contribution to the Biology and Developmental History of some Eriophyids, with Systematic Remarks.]—*Chur,* 1917. (Abstract in *Zeitschr. angew. Ent., Berlin,* viii, no. 1, September 1921, pp. 222–223.)

Though the injury usually done by gall-mites of the genus *Eriophyes* is unimportant, the occurrence of very large numbers of them may prove serious.

The development and biology of these mites is discussed, with special reference to *Eriophyes tiliae* and *E. avellanae,* of which *E. vermiformis* is treated as a synonym.

Urich (F. W.). **The Mango Midge.**—*Bull. Dept. Agric. Trinidad & Tobago, Port-of-Spain,* xix, no. 3, 1921, p. 110.

Mangos suffer from the attacks of a small midge in seasons when it is not sufficiently kept in check by its natural enemies. Oviposition occurs in the youngest flower and leaf buds, and the young larvae bore into the tissues and form small swellings, inside which they feed on the sap until the young leaves and flowers die. Small decayed spots also appear on the flower-stalks, through which injurious fungi can invade the plant. After 10 to 14 days the larvae emerge from the shoots and fall to the ground, where they construct cocoons of silk

and particles of earth Adults appear about a week later, the cycle requiring 21 to 30 days. The only remedial measure that seems feasible is to prevent the larvae from entering the soil by covering the ground under the trees with lime. Moist weather during the dry season seems favourable to the flies. Further investigations are being made.

Williams (C. B.). **Sugar-cane Pests and Diseases in Trinidad in 1920.**—*Bull. Dept. Agric. Trinidad & Tobago, Port-of-Spain,* xix, no. 3, 1921, pp. 111–121.

The information in this paper regarding *Tomaspis saccharina* (sugar-cane froghopper) in Trinidad is supplementary to that previously noticed [*R. A.E.*, A, ix, 261]. The seasonal appearance of, and damage done by, this pest in various localities, and the influence of rainfall, soil and ratooning are discussed. An extensive outbreak of a fungus, *Empusa,* among the froghoppers occurred in November and December 1920. It was probably connected with the large third generation, which appeared unusually late, and with the wet weather experienced in November.

The present situation with regard to mosaic disease and its effect on the sugar-cane plant is discussed. It was first discovered in Trinidad in 1920, and has since spread considerably. While it is recognised that the disease is spread from diseased to healthy plants chiefly, if not entirely, by insects, it has not yet been definitely determined which insects are capable of transmitting the infection. Species that are proved or suspected carriers in other countries are mostly rare or non-existent in Trinidad. Aphids do not seem to be present on sugar-cane ; the occurrence of *Pulvinaria* (leaf scale) is doubtful, and *Stenocranus* (cane fly) is extremely rare. Tests have been made by transferring from infected to healthy canes individuals of *Tomaspis saccharina, Peregrinus maidis* (corn leaf-hopper), a cane leaf-hopper, *Tettigoniella laudata* and the cane Membracid, *Ceresa vitulus,* F., var. *minor,* Fowl., but in no case was the disease transmitted. The only other insect that seems sufficiently abundant to account for the known spread is a mealybug [*Pseudococcus*], and experiments with this are proceeding.

Hutson (J. C.). **Report of the Division of Entomology, April–June, 1921.**—*Trop. Agric., Peradeniya,* lvii, no. 3, September 1921, p. 194.

Odoiporus longicollis (weevil stem-borer) and *Cosmopolites sordidus* (weevil bulb-borer) were prevalent on bananas, especially in plantations maintained for more than two years without replanting. An outbreak of the Limacodid, *Natada nararia* (fringed nettle-grub) in June on tea was investigated, and the caterpillars were found feeding on inter-planted dadap and other plants.

The following insects have been reported during the quarter :—*Homona coffearia* (tea tortrix), *Batocera rubus* (rubber stem and root borer), *Schoenobius incertellus* (paddy stem-borer), *Terastia meticulosalis* (dadap shoot-borer), *Hypsipyla robusta* (toona shoot-borer), mango fruit fly (*Dacus* sp.), and *Ceroplastodes cajani* on *Tephrosia candida.* Special investigations are in progress on the termites, *Calotermes militaris, Spodoptera mauritia* (paddy swarming caterpillar) and *Aularches miliaris* (spotted locust).

Froggatt (W. W.). **The Shot-hole Borer** (*Platypus omnivorus*, **Lea**).—*Agric. Gaz., N.S.W., Sydney,* xxxii, pt. 9, September 1921, pp. 645–648, 5 figs.

The damage caused by *Anobium domesticum* and *Lyctus brunneus* (powder-post beetle) has already been noticed [*R. A.E.*, A, vi, 390; viii, 333]. Shot-hole borers, of which *Platypus omnivorus*, Lea, is a typical example, may infest timber in the forest, logs in sawmills, and boards stacked in sheds for seasoning, by boring circular burrows into the timber through the bark.

P. omnivorus is widely distributed through the New South Wales coastal forests, and the principal timbers damaged are *Trochocarpa laurina*, blackwood (*Acacia melanoxylon*), corkwood (*Schizomeria ovata*), sassafras (*Doryphora sassafras*) and coachwood (*Cerapetalum apetalum*). The beetles are active from December to February, penetrating the sapwood and boring into the solid material of the logs. A sawmill inspection in February of newly sawn boards showed many beetles in burrows, some ovipositing, and some active larvae.

The measures recommended are the removal and destruction of all dead and dying trees from forest areas. Timber cut and stacked should be sprinkled beneath the stacks and between the layers with a 5 per cent. solution of water and carbolic acid mixed with sawdust

Illingworth (J. F.). **Monthly Notes on Grubs and other Cane Pests.** (**Fourth Series**).—*Queensland Bur. Sugar Expt. Sta., Div. Ent., Brisbane,* 1920–1921, Bull. 15, 39 pp., 4 figs.

This bulletin collates the results of investigations on sugar-cane pests in Queensland from July 1920 to May 1921, most of which have already been noticed [*R. A.E.*, A, ix, 89, 219, 295, 455, 531].

Froggatt (J. L.). **Banana Beetle Borer Investigations** (**First Progress Report**).—*Queensland Agric. Jl., Brisbane,* xvi, pt. 3, September 1921, pp. 200–208, 4 plates.

Investigations carried out on *Cosmopolites sordidus* (banana beetle-borer) from 1st January to 30th June 1921, are recorded. The eggs are laid singly, and usually within two feet of the cut end of stems lying in the plantations, just beneath the surface, and close to the crown of the corm where it is attached to the stem. The larvae hatch in 17–21 days, and in the warm season take from 3–4 weeks to mature. They feed principally on the corm, sometimes tunnelling into the central core of the stem, and may do considerable damage. The pupal chamber in the corm is below ground level, but the position varies in cut stems, though it is generally just beneath the surface. A pupa from a larva in a corm in the laboratory at the end of May matured in 14 days. The beetle lies dormant in the pupal chamber for several days.

The adult weevils do not fly, and avoid light. They feed on the corms and rotting stems. Their life is of considerable duration. Immediately after heavy rains their numbers under corm baits diminish, but their habitat at these times has not yet been determined. Corms, or stems with the corm attached, left lying about serve as breeding places.

The only natural enemy so far known in Queensland is an Elaterid larva.

The baits recommended have already been noticed [*R. A.E.*, A, vii, 86; viii, 394, etc.]. Every precaution should be taken to prevent this pest from spreading into uninfested plantations.

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